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VOICEGRADE SPECIAL ACCESS SERVICE, FEATURE GROUP A AND WATS ACCESS LINES ACCEPTANCE AND IMMEDIATE ACTION TRANSMISSION TESTS AND LIMITS

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VOICEGRADE SPECIAL ACCESS SERVICE, FEATURE GROUP A AND WATS ACCESS LINES ACCEPTANCE AND IMMEDIATE ACTION TRANSMISSION TESTS AND LIMITS

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1. GENERAL

A. Purpose

1.01 This practice provides acceptance and immediate action transmission tests and limits for the various voice grade special access channels (VG1-VG12), the Wide Area Telecommunications Service (WATS) access line and the Feature-Group A switched access service. For purposes of this practice, these circuits are referred to as channels. Although they are tariffed as switched access services, Feature-Group A channels are included in this practice because they are used to furnish services that have traditionally been considered special service circuits. The acceptance and immediate action tests and limits contained herein have been determined by the performance required for the type of service each channel will provide. The acceptance and immediate action tests and limits include both voice and voiceband data parameters that should be tested for each channel. This practice also provides the acceptance and immediate action tests and limits that apply to the optional C, data capability, and T-conditioning options available with certain channels.

1.02 Whenever this practice is reissued, the reason for reissue will be given in this paragraph.

B. Application

1.03 These channels are provided by the Bell Operating Company for use by the Interexchange Carrier to gain access to the end user in the local access and transport area (LATA). For Multipoint Service the links (End/Mid) are tested as 2 point channels. Voice grade channels are provided between:

- An Interexchange Carrier point of termination (POT) within the LATA and an end user point of termination (POT) on the end user's premises
- the Interexchange Carrier POT and a Telephone Company central office
- two Interexchange Carrier POTs
- an End User POT and a Telephone Co. (TC) bridge (End Link)
- two TC bridges (Mid Link)
- IC POT and TC bridge (Mid Link)
- WATS access line channels extended from and End User POT to a Telephone Company central office that is equipped for Feature-Group C or D switched access service.
- Feature group A channels extend from an Interexchange Carrier POT to the line side termination at a Telephone Company end office.
- Jurisdictionally Interstate Service (JIS) for IntraLATA end user to end user service that meets one of the following criteria:

  (1) Interstate intraLATA, where a LATA boundary crosses a state boundary

  (2) Interstate Corridor service between, for example, a large city in one state and several counties in another state sharing a community of interest

  (3) International service outside the continental United States

  (4) ***Contaminated*** services which are all intraLATA circuits that may carry interstate traffic either occasionally or predominately by being connected to interstate circuits.

C. Acceptance and Immediate Action Test Requirements and Limits (Tables A & B)

1.04 Acceptance tests are listed in Table A. These are defined as either billable or nonbillable when requested by an Interexchange Carrier. Table B lists those transmission parameters that are tariffed and require immediate action treatment.

1.05 Immediate action limits are the parameter values beyond which a channel is considered to be out of limits and immediate corrective action is required. The immediate action limits are identical to the tariff specifications.

1.06 The acceptance test limit is the parameter limit that is allowable when cooperative acceptance testing is conducted with an interexchange carrier or customer. Although this limit is not included in the tariff, it is covered under other documentation available to the interexchange carrier (i.e., TECHNICAL REFERENCE TR-NPL-000335). This limit is sufficiently more stringent than the immediate action limit to give the interexchange carrier the assurance that the service performance is not approaching the immediate action limit.

TABLE A

ACCEPTANCE TEST REQUIREMENTS

(Notes 1 and 2)

TEST	VOICE GRADE CHANNEL						
	VGs 1,2,3	VG4	VG5	VGs 6,7,8 9,10,11	VG12	VGC	WAL
LOSS	R	R	R	R	R	R	R
SLOPE (Note 3)	R (R)	R (R)	R	R (R)	R (R)	R (R)	R (R)
ATTENUATION DISTORTION (Note 3)	NR	NR	NR	NR	NR	NR	NR
C MESSAGE NOISE	R (T)	R (T)	R (T)	R (T)	R (T)	R	R (V)
C NOTCHED NOISE	NA	NA	R (G)	R (H)	R (I)	R (J)	NR
IMPULSE NOISE	NA	NA	NR	NR	NR	NR	NR
ECHO CONTROL (Note 4)	NR	NA	NR	NR	NR	NR	NR
ENVELOPE DELAY DISTORTION	NA	NA	NA	NR	NR	NR	NR
INTERMODULATION DISTORTION	NA	NA	NA	NR	NR	NR	NR
PHASE JITTER	NA	NA	NA	NR	NA	NR	NR
FREQUENCY SHIFT	NA	NA	NA	NR	NR	NR	NR
SIGNAL TO C-MESSAGE NOISE	NA	NR	NA	NA	NA	NA	NA
OPERATIONAL SIGNALING (Note 5)	R	NA	NA	R VGs 7,8,9	NA	NA	R

Notes:

1. These test requirements apply to both basic (non-conditioned) and conditioned (C, DA, or T) channels.
2. R = Required Test at Customer request (Non Billable) Applicable Table is in parenthesis. NR = Not required, but a billable test at the customer's request. NA = Not Applicable.
3. Both Slope and Attenuation Distortion are approximate ways to measure channel frequency response (a tariffed parameter). See Table S for test frequencies. Slope is adequate for acceptance tests and is specified as non-billable. At the customer request, Attenuation Distortion is available as a billable test.
4. Echo control is not applicable when both points of termination are 4-wire. In addition, echo control is a required test when the improved return loss at the End User POT for effective 2-wire transmission option is ordered.
5. When Applicable (Reference BR 313-300-101)

TABLE B

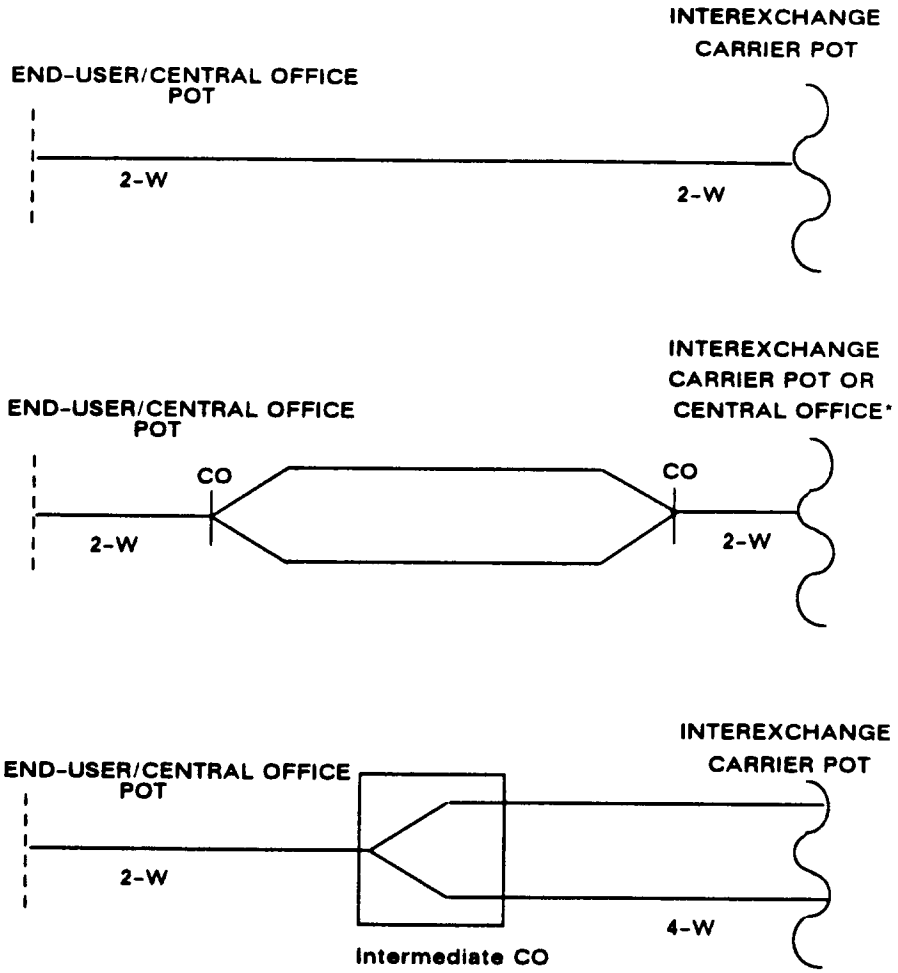
TARIFFED PARAMETERS
CONDITIONED AND NON-CONDITIONED CHANNELS
(See Note)

PARAMETER	CHANNEL
LOSS	ALL CHANNELS
FREQUENCY RESPONSE (3-TONE SLOPE OR ATTN.DIST)	ALL CHANNELS
C-MESSAGE NOISE	ALL CHANNELS
C-NOTCHED NOISE	VG5-12,VGC and WATS ACCESS LINES
IMPULSE NOISE	VG5-12, VGC and WATS ACCESS LINES
ECHO CONTROL (IMP.BAL)	VGs 1,2,3,5,7,8,11,12,VGC and WATS ACCESS LINES
ENVELOPE DELAY DISTORTION	VG6-12, VGC and WATS ACCESS LINE
INTERMODULATION DISTORTION	VG6-11, VGC and WATS ACCESS LINES
PHASE JITTER	VG6-11, VGC and WATS ACCESS LINES
FREQUENCY SHIFT	VG6-12, VGC and WATS ACCESS LINES
SIGNAL-TO-C-MESSAGE NOISE	VG4

Note: Tariffed parameters for Feature-Group A channels are provided in Part 3 of this practice.

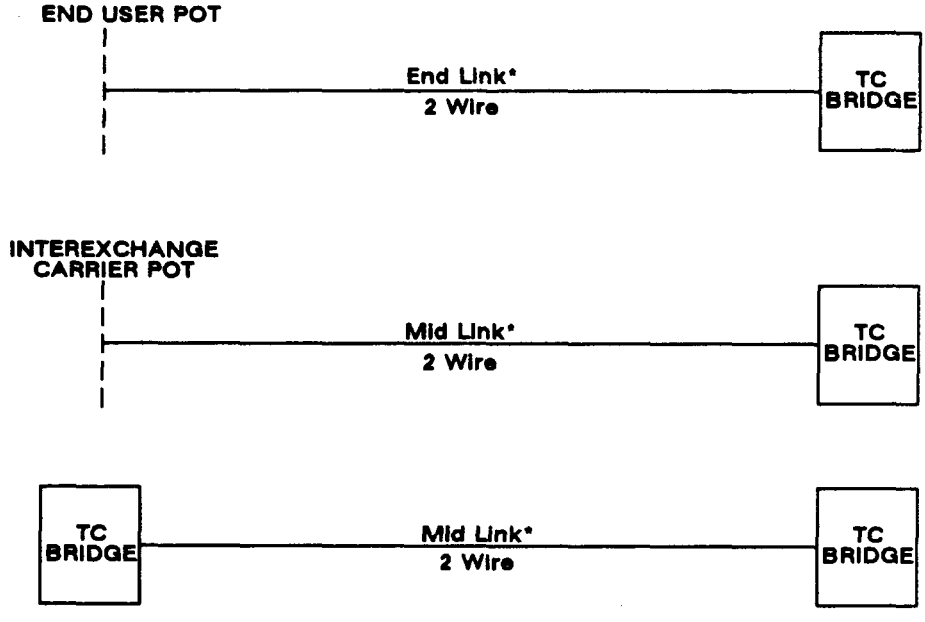
D. Channel Configurations

1.07 Technical specifications refer to effective 2-wire and effective 4-wire transmission capability. The channels provided by the Telephone Company typically contain a mix of facilities such as analog carrier, digital carrier, single gauge metallic cable, mixed-gauge metallic cable, and subscriber loop carrier. An effective 2-wire channel may terminate in either a 2-wire or 4-wire interface (see Fig. 1). It may be entirely 2-wire, such as a channel made up of entirely metallic cable, or the channel may contain a 4-wire section such as a carrier facility with a 2-wire metallic cable extension. An effective 2-wire channel will contain at least one 2-wire segment and its transmission performance is that of a 2-wire channel. With effective 2-wire transmission, simultaneous transmission in both directions may be possible but it is not assured.



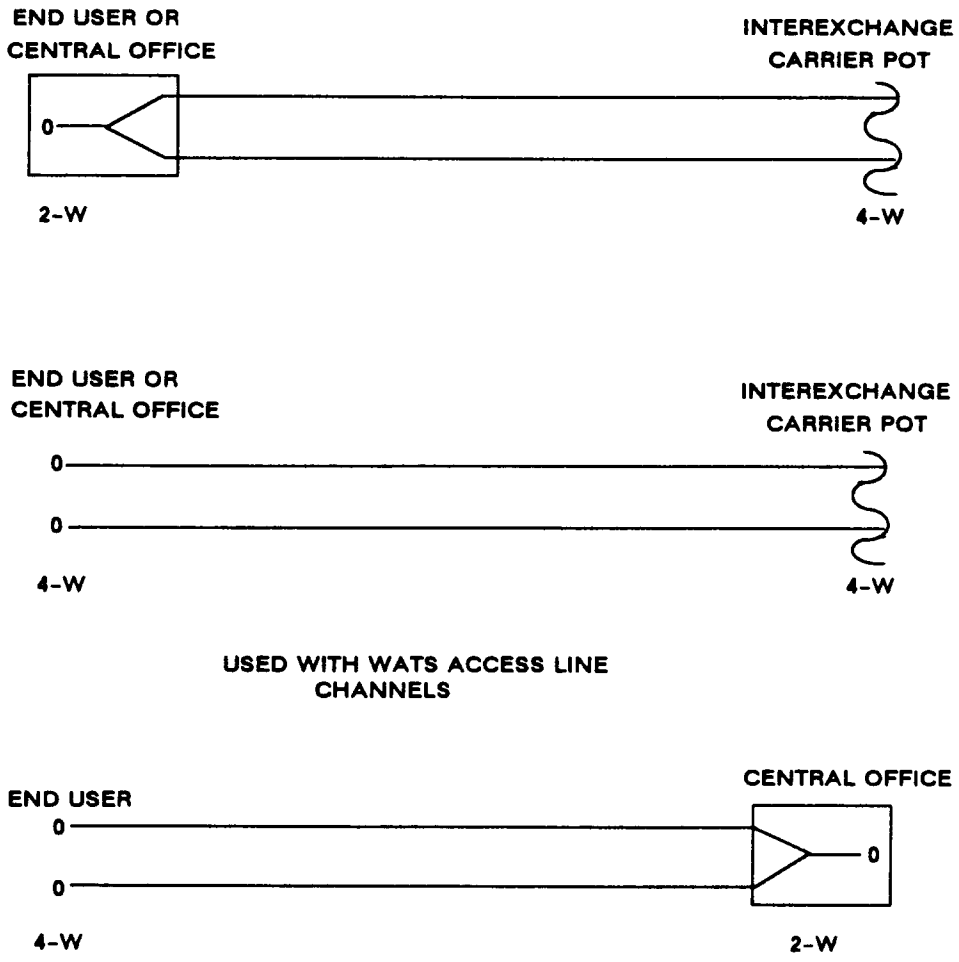
Note: See Figure 15 for Jurisdictionally Interstate Channel Configurations.

Fig. 1 - Typical Effective 2-Wire Channel Configuration



* Intended For 1-Way Service

Fig. 1A - Typical Effective 2-Wire Multipoint Configurations



Note: See Figure 15 for Jurisdictionally Interstate Channel Configurations.

Fig. 2 - Typical Effective 4-Wire Channel Configurations

1.08 An effective 4-wire channel may terminate in a 2-wire interface at the end user premises or central office end but, the Interexchange Carrier end must be a 4-wire interface (see Fig.2). An effective 4-wire channel is entirely 4-wire with no intermediate 2-wire segments. Its transmission performance is that of a 4-wire channel. Effective 4-wire channels assure simultaneous transmission in both directions except when the channel is terminated in a 2-wire interface.

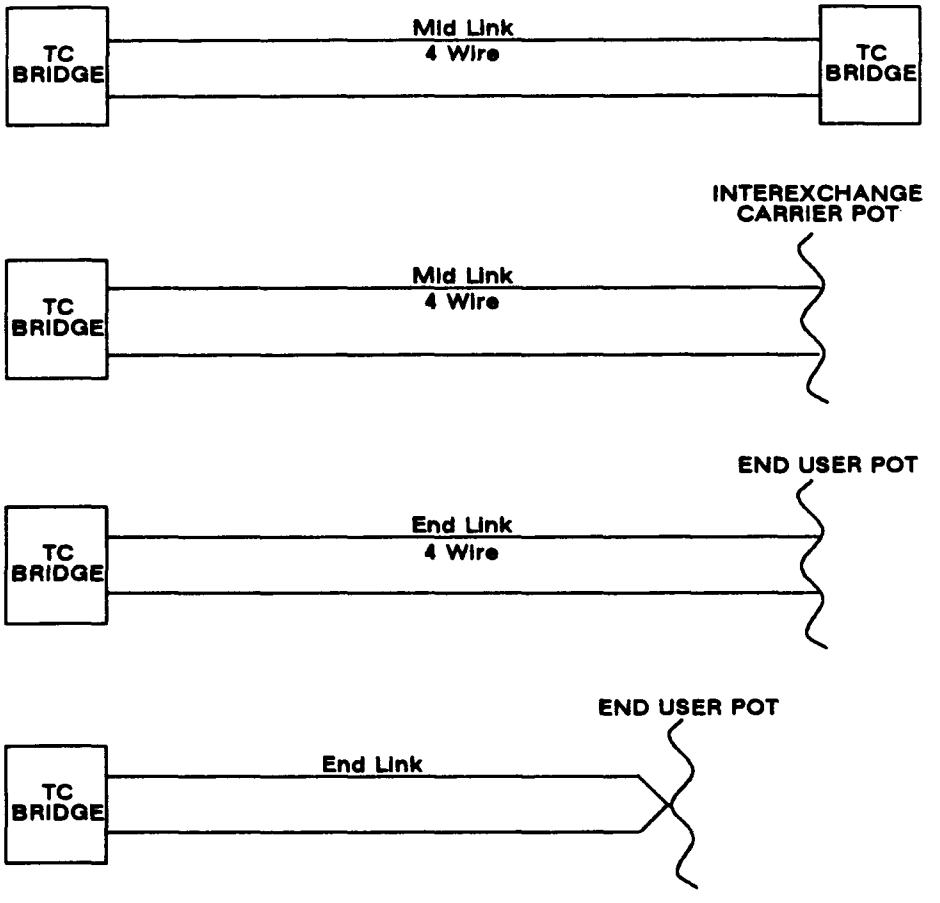


Fig. 2A - Typical Effective 4-Wire Multipoint Configurations

1.09 The method of implementing transmission on an effective 4-wire channel (whether the separation is physical, time domain, or frequency domain) is at the discretion of the Telephone Company.

1.10 Analog and digital multiplexing at the Interexchange Carrier end is an option available with most channels. At the Interexchange Carrier end, the channel is part of a DS-1 or higher rate signal or part of a group (or higher capacity) analog system. With this option, the stated limits apply to the derived voice frequency (VF) channel as measured between the customer premises and the Interexchange Carrier POT or between the central office and the Interexchange Carrier POT. Parameters such as loss and noise can be measured at a digital multiplex interface with digital test equipment but an analog multiplex signal usually needs demultiplexing before measuring the voice frequency channel. 'These measurements should only be made on an exception basis when all other alternatives have been exhausted.

1.11 Table B lists the tariffed parameters. Both slope and attenuation distortion are ways of measuring frequency response. Usually, a slope measurement is made using three test frequencies (404 Hz and 2804 Hz referenced to 1004 Hz) for a quick test of the channel frequency response. An attenuation distortion measurement uses frequencies spaced approximately every two-hundred Hertz apart throughout the frequency band. This provides a more accurate picture of the channel frequency response. Attenuation distortion measurements are necessary on most of the conditioned channels. These tests should be made at both interfaces and in both directions of transmission. The test requirements specify whether a slope or attenuation distortion measurement should be made and the channel must be within the stated limits at all test frequencies. Table R lists the acceptance and immediate action limits for both attenuation distortion and slope and Table S provides the test frequencies used for both.

1.12 All of the tariffed parameters listed in Table B must be supported. If a tariffed parameter does not meet the immediate action limits, corrective action must be taken.

1.13 Usually the transmit and receive levels are specified by the type of service but some transmission levels are offered within allowable ranges (see TR-NPL-000335). The exact levels should be stipulated on the circuit layout card or WORD document. The usable frequency range for the channels discussed in this practice is nominally 304 to 3004 Hz.

2. LATA SPECIAL ACCESS CHANNEL DESCRIPTIONS

A. Voice Grade 1 (Service Code LB)

General

2.01 Voice Grade 1 (VG1) channels are suitable for the access segment of basic two-point nonswitched voice circuits. Typical configurations are shown in Figure 3.

2.02 A VG1 channel extends from the End User POT to an Interexchange Carrier POT. The transmission interfaces are either 2- or 4-wire at each end. This channel will support effective 2-wire or effective 4-wire transmission.

Application

2.03 Voice Grade 1 is suitable for services such as:

- Overseas connecting facility
- Voice grade facility
- Access facility
- Alarm circuit

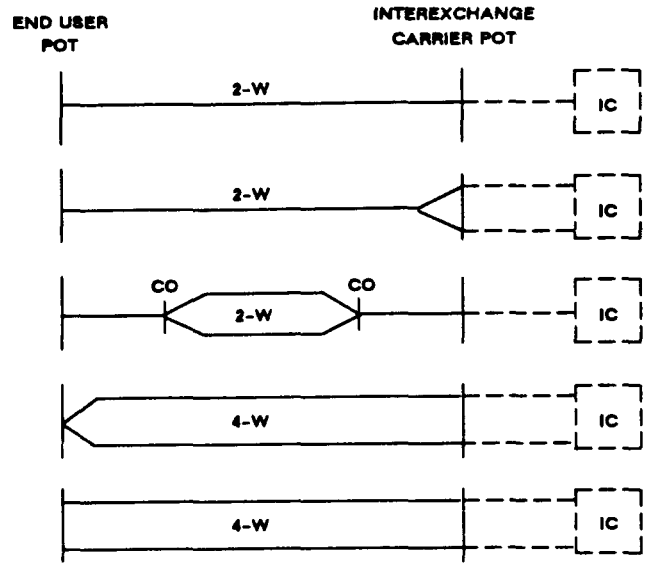


Fig. 3 - Typical Voice-Grade 1 Channel Configurations

Acceptance and Immediate Action Tests -Voice Grade 1 (Table C)

2.04 Table C lists the acceptance and immediate action tests and descriptions.

TABLE C

ACCEPTANCE AND IMMEDIATE ACTION TESTS FOR VOICE GRADE 1

PARAMETER (See Note)	ACCEPTANCE LIMIT	IMMEDIATE ACTION LIMIT
1. LOSS	Measure (and record) 1004 Hz loss. LIMIT: ±1.0 dB of EML	Measure (and record) 1004 Hz loss. LIMIT: ±4.0 dB of EML
SLOPE	See Table R for limits.	See Table R for limits.
3. C- MESSAGE NOISE	See Table T for limits.	See Table T for limits.
4. ECHO CONTROL (Billable)	See Table AA.	See Table AA.
5. OPERATIONAL SIGNALING	BR313-300-101	

Note: Both Slope and Attenuation Distortion are ways of measuring frequency response (which is a tariffed parameter). Slope is adequate for acceptance tests and is specified as a non-billable test. Attenuation Distortion testing is available at the customer request but is billable. See Table S for the test frequencies to be used when testing for Slope and Attenuation Distortion.

B. Voice Grade 2 (Service Code LC)

General

2.05 Voice Grade 2 (VG2) channels are suitable for the access segment of voice two-point private line and switched special service circuits. For services such as FX that are switched at a Telephone Company central office, this channel is suitable for the station or "closed end" only. The "open end" of an FX service is provided by switched access Feature-Group A channels. Typical configurations are shown in Figure 4.

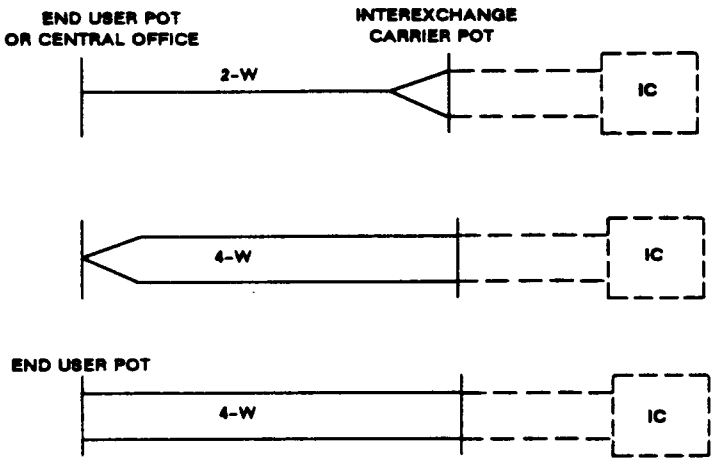


Fig. 4 - Typical Voice-Grade 2 Channel Configurations

2.06 A VG2 channel extends from the End User POT or Telephone Company central office where a centrex switch is located, to the Interexchange Carrier POT. The transmission interface is 2- or 4-wire at the End User POT, 2-wire at the Telephone Company central office, and 4-wire at the Interexchange Carrier end. This channel will support effective 2-wire or effective 4-wire transmission.

Application

2.07 Voice Grade 2 is suitable for services such as:

- Foreign Exchange Line (closed end)
- Extension Service
- Intercommunication Off-Premises Station Line
- Long Distance Terminal Line
- Off-Premises Station Line
- Off-Premises Extension
- Private Line Voice Circuit
- Paging Circuit
- Radio Land Line
- Secretarial Line
- Turret or ACD Line.

Acceptance and Immediate Action Tests - Voice Grade 2 (Table D)

2.08 Acceptance and Immediate Action tests for Voice Grade 2 channels are listed in Table D along with descriptions and limits.

TABLE D

ACCEPTANCE AND IMMEDIATE ACTION TESTS FOR VOICE GRADE 2

PARAMETER (See Note)	ACCEPTANCE LIMIT	IMMEDIATE ACTION LIMIT
1. LOSS	**Measure (and record) 1004 Hz loss. LIMIT: ±1.0 dB of EML**	**Measure (and record) 1004 Hz loss. LIMIT: ±1.5 dB of EML**
2. SLOPE	**See Table R for limits.**	**See Table R for limits.**
3. C- MESSAGE NOISE	**See Table T for limits.**	**See Table T for limits.**
4. ECHO CONTROL (Billable)	**See Table AA.**	**See Table AA.**
5. OPERATIONAL SIGNALING	**BR313-300-101**	

Note: Both Slope and Attenuation Distortion are ways of measuring frequency response (which is a tariffed parameter). Slope is adequate for acceptance tests and is specified as a non-billable test. Attenuation Distortion testing is available at the customer request but is billable. See Table S for the test frequencies to be used when testing for Slope and Attenuation Distortion.

C. Voice Grade 3 (Service Code LD)

General

2.09 Voice Grade 3 (VG3) channels are suitable for the access segment of voice trunk-type circuits. Typical configurations are shown in Figure 5.

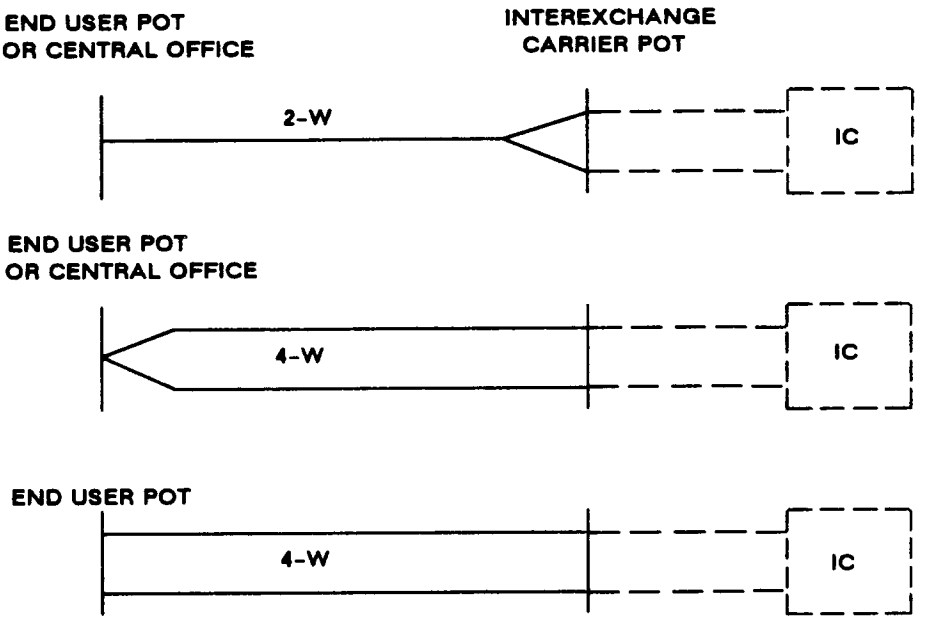


Fig. 5 - Typical Voice Grade 3 Channel Configurations

2.10 A VG3 channel extends from the End User POT or Telephone Company central office, where a centrex switch is located, to the Interexchange Carrier POT. The transmission interface is 2- or 4-wire at the End User POT, 2-wire at the central office and 4-wire at the Interexchange Carrier end. This channel will support effective 2-wire or effective 4-wire transmission.

Application

2.11 Voice Grade 3 is suitable for service such as:

- Foreign Exchange Trunk (closed end)
- Remote Attendant Trunk
- Long Distance Trunk
- Alternate Service
- Tie Trunk
- SSN Access Line
- SSN Station Line
- Local Off-Network Access Line
- SSN Tie Trunk
- Turret or ACD Trunk
- Off-Network Equivalent Service

- Switched Access
- Station and Premise Connecting Facility.

Acceptance and Immediate Action Tests - Voice Grade 3 (Table E)

2.12 Table E contains a list of test parameters for Voice Grade 3 along with the test description and limits.

TABLE E

ACCEPTANCE AND IMMEDIATE ACTION TESTS FOR VOICE GRADE 3

PARAMETER	ACCEPTANCE LIMIT	IMMEDIATE ACTION LIMIT
1. LOSS	**Measure (and record) 1004 Hz loss. LIMIT: ±1.0 dB of EML**	**Measure (and record) 1004 Hz loss. LIMIT: ±1.5 dB of EML**
2. SLOPE (See Note)	**See Table R for limits.**	**See Table R for limits.**
3. C- MESSAGE NOISE	**See Table T for limits.**	**See Table T for Limits.**
4. ECHO CONTROL (Billable)	**See Table Z.**	**See Table Z.**
5. OPERATIONAL SIGNALING	**BR 313-300-101**	

Note: Both Slope and Attenuation Distortion are ways of measuring frequency response (which is a tariffed parameter). Slope is adequate for acceptance tests and is specified as a non-billable test. Attenuation Distortion testing is available at the customer request but is billable. See Table S for the test frequencies to be used when testing for Slope and Attenuation Distortion.

D. Voice Grade 4 (Service Code LE)

General

2.13 Voice Grade 4 (VG4) is suitable for the access segment of specialized voice/tone circuits. This service provides 2-way voice transmission and 1-way or 2-way transmission of control tones for operating or monitoring the status of radio transceivers. This service was developed per government specification S-1142A. However, it is available to all customers. A typical configuration is shown in Figure 6.

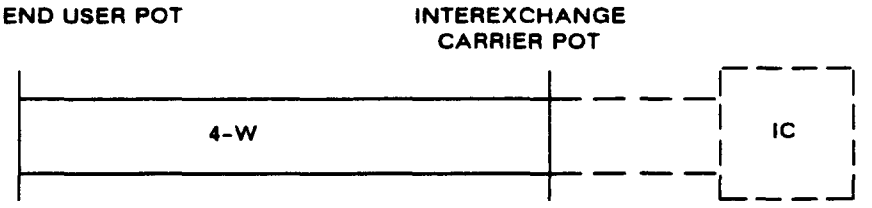


Fig. 6 - Typical Voice-Grade 4 Channel Configuration

2.14 A VG4 channel extends from the End User POT to the Interexchange Carrier POT. The transmission interfaces are 4-wire at the End User and at the Interexchange Carrier end. This channel will support effective 4-wire transmission.

Application

2.15 Voice Grade 4 channels are suitable for use as part of the facilities required to provide FAA voice plus control tone circuits under FAA specification S-1142A. This service is now available to all customers.

Acceptance and Immediate Action Tests - Voice Grade 4 (Table F)

2.16 Table F contains the test parameters for Voice Grade 4 plus the test descriptions and limits.

TABLE F

ACCEPTANCE AND IMMEDIATE ACTION TESTS FOR VOICE-GRADE 4

PARAMETER (Notes 1,2,& 3)	ACCEPTANCE LIMIT	IMMEDIATE ACTION LIMIT
1. LOSS	**Measure (and record) 1004 Hz loss. LIMIT: ±0.5 dB of EML**	**Measure (and record) 1004 Hz loss. LIMIT: ±1.0 dB of EML**
2. SLOPE	**See Table R for limits.**	**See Table R for limits.**
3. C- MESSAGE NOISE	**See Table T for limits.**	**See Table T for limits.**
4. SIGNAL TO C MESSAGE NOISE RATIO (Billable)	**44 dB referenced to -8 dBm0 holding tone from 304 to 2504 Hz. 24 dB referenced to -15 dBm0 holding tone from 2604 to 3004 Hz.**	**41 dB referenced to -8 dBm0 holding tone from 304 to 2504 Hz. 21 dB referenced to -15 dBm0 holding tone from 2604 to 3004 Hz.**

Notes:

1. Both Slope and Attenuation Distortion are ways of measuring frequency response (which is a tariffed parameter). Slope is adequate for acceptance tests and is specified as a non-billable test. Attenuation Distortion testing is available at the customer request but is billable. See Table S for the test frequencies to be used when testing for Slope and Attenuation Distortion.
2. Billable tests should be made only at the customers request as an acceptance test.
3. Signal to C message noise, although a tariffed item, is not expected to be measured except in a trouble condition.

E. Voice Grade 5 (Service Code LF)

General

2.17 Voice Grade 5 (VG5) channels are suitable for the access segment of low-speed voice grade data circuits. Typical configurations for Voice Grade 5 channels are shown in Figure 7.

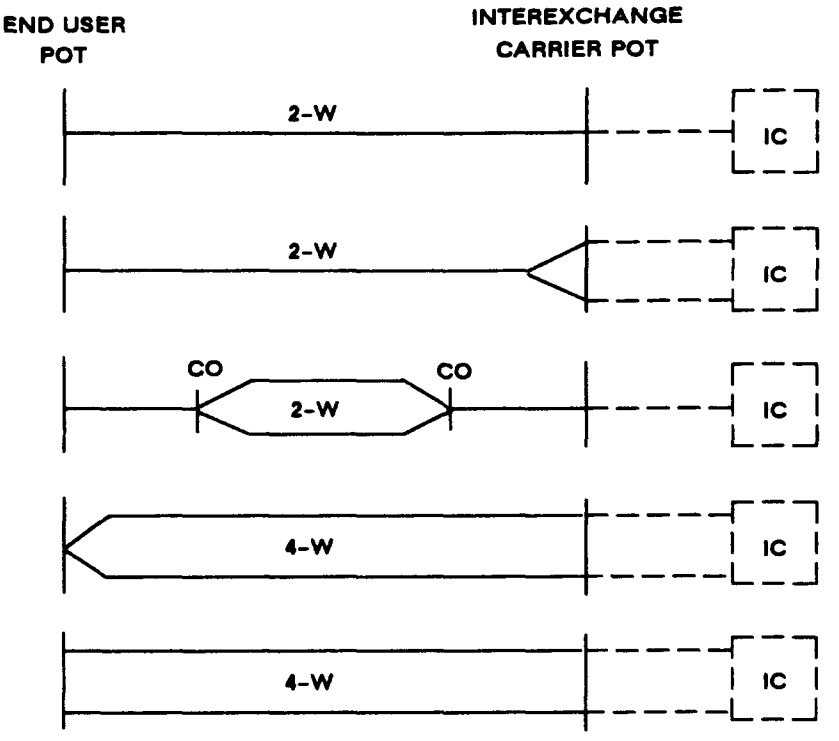


Fig. 7 - Typical Voice-Grade 5 Channel Configurations

2.18 A VG5 channel extends from the End User POT to the Interexchange Carrier POT. The transmission interfaces are 2- or 4-wire at the End User and at the Interexchange Carrier end. This channel will support effective 2-wire or effective 4-wire transmission.

Application

2.19 Voice Grade 5 channels are suitable for services such as:

- Protective Alarm
- DATAPHONE® Select-A-Station.

Acceptance and Immediate Action Tests - Voice Grade 5 (Table G)

2.20 Table G contains the test parameters, test descriptions, and limits for Voice Grade 5 channels without C-conditioning.

Note: See Table X (Part 1) for tests on channels requiring optional C-conditioning. Table X (Parts 2 and 3) lists the limits for the optional Improved Attenuation Distortion and Improved Envelope Delay Distortion.

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TABLE G

ACCEPTANCE AND IMMEDIATE ACTION TESTS FOR VOICE-GRADE 5

WITHOUT OPTIONAL CONDITIONING

PARAMETER (Notes 1,2, & 3)	ACCEPTANCE LIMIT	IMMEDIATE ACTION LIMIT
1. LOSS	Measure (and record) 1004 Hz loss. LIMIT: ±1.0 dB of EML	Measure (and record) 1004 Hz loss. LIMIT: ±1.5 dB of EML
2. SLOPE	See Table R for limits.	See Table R for limits.
3. C- MESSAGE NOISE	See Table T for limits.	See Table T for limits.
4. C-NOTCHED NOISE (-13 dBm0 holding tone)	28 dB Minimum S/N Ratio or Maximum 49 dBrnc0	26 dB Minimum S/N Ratio or Maximum 51 dBrnc0
5. IMPULSE NOISE (Billable)	≤15 counts in 15 minutes @ 65 dBrnc0	≤15 counts in 15 minutes @ 67 dBrnc0
6. ECHO CONTROL (Billable)	See Table AA.	See Table AA.
EXPECTED PERFORMANCE (-13 dBm0 Holding Tone)		
GAIN HITS PHASE HITS DROP OUTS (Note 3)	≤2 in 15 min. ≤2 in 15 min. ≤1 in 15 min.	≥3 dB ≥20 degrees ≥12 dB

Notes:

1. Both Slope and Attenuation Distortion are ways of measuring frequency response (which is a tariffed parameter). Slope is adequate for acceptance tests and is specified as a non-billable test. Attenuation Distortion testing is available at the customer request but is billable. See Table S for the test frequencies to be used when testing for Slope and Attenuation Distortion.
2. Billable tests should be made only at the customers request as an acceptance test.
3. Gain Hits, Phase Hits, and Drop Outs are expected to be measured primarily during trouble investigations.

F. Voice Grade 6 (Service Code LG)

General

2.21 Voice Grade 6 (VG6) channels are suitable for the access segment of most two-point voice grade data circuits. Figure 8 is a typical configuration of a Voice Grade 6 channel.

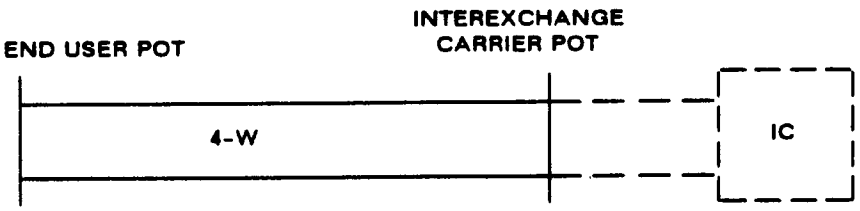


Fig. 8 - Typical Voice-Grade 6 Channel Configuration

2.22 A VG6 channel extends from the End User POT to the Interexchange Carrier POT. The transmission interfaces are 4-wire at the End User and at the Interexchange Carrier end.

Application

2.23 Voice Grade 6 is suitable for services such as:

- Two-Point Private Line Data
- Multiplex Line
- CSACC Link (EPSCS)
- Digital Data - Off Net Extension
- CNCC Link (EPSCS)
- Control/Remote Metering

Acceptance and Immediate Action Tests - Voice Grade 6 (Table H)

2.24 Test parameters, test descriptions and limits for Voice Grade 6 channels without optional conditioning are contained in Table H.

Note: See Table X (Parts 1-3) for tests on channels with optional conditioning. Table Y lists the tests for the Data Capability option.

TABLE H

ACCEPTANCE AND IMMEDIATE ACTION TESTS FOR VOICE-GRADE 6

WITHOUT OPTIONAL CONDITIONING

PARAMETER (Notes 1,2 & 3)	ACCEPTANCE LIMIT	IMMEDIATE ACTION LIMIT
1. LOSS	Measure (and record) 1004 Hz loss. LIMIT: ±1.0 dB of EML	Measure (and record) 1004 Hz loss. LIMIT: ±1.5 dB of EML
2. SLOPE	See Table R for limits.	See Table R for limits.
3. C- MESSAGE NOISE	See Table T for limits.	See Table T for limits.
4. C-NOTCHED NOISE (-13 dBm0 holding tone)	32 dB Minimum S/N Ratio or Maximum 45 dBrnc0	30 dB Minimum S/N Ratio or Maximum 47 dBrnc0
5. IMPULSE NOISE (Billable)	≤15 counts in 15 minutes @ 65 dBrnc0	≤15 counts in 15 minutes @ 67 dBrnc0
6. ENVELOPE DELAY DISTORTION (Billable)	804 - 2604 Hz = 650 μsec.	804 - 2604 Hz = 700 μsec.
7. PHASE JITTER Degrees (Billable)	20 - 304 Hz = 4° peak to peak 4 - 304 Hz = 9° peak to peak	20 - 304 Hz = 5° peak to peak 4 - 304 Hz = 10° peak to peak
8. INTERMODULATION DISTORTION (Billable)	R2 ≥35 dB R3 ≥42 dB	R2 ≥33 dB R3 ≥40 dB
9. FREQUENCY SHIFT (Billable)	≤1 Hz	≥1 Hz
EXPECTED PERFORMANCE (-13 dBm0 Holding Tone)		
GAIN HITS PHASE HITS DROP OUTS (Note 3)	≤2 in 15 min. ≤2 in 15 min. ≤1 in 15 min.	≥3 dB ≥20 degrees ≥12 dB

Notes:

1. Both Slope and Attenuation Distortion are ways of measuring frequency response (which is a tariffed parameter). Slope is adequate for acceptance tests and is specified as a non-billable test. Attenuation Distortion testing is available at the customer request but is billable. See Table S for the test frequencies to be used when testing for Slope and Attenuation Distortion.
2. Billable tests should be made only at the customers request as an acceptance test.
3. Gain Hits, Phase Hits, and Drop Outs are expected to be measured primarily during trouble investigations.

G. Voice Grade 7 (Service Code LH)

General

2.25 Voice Grade 7 (VG7) channels are suitable for the access segment of medium speed voice grade data circuits. Typical configurations are shown in Figure 9.

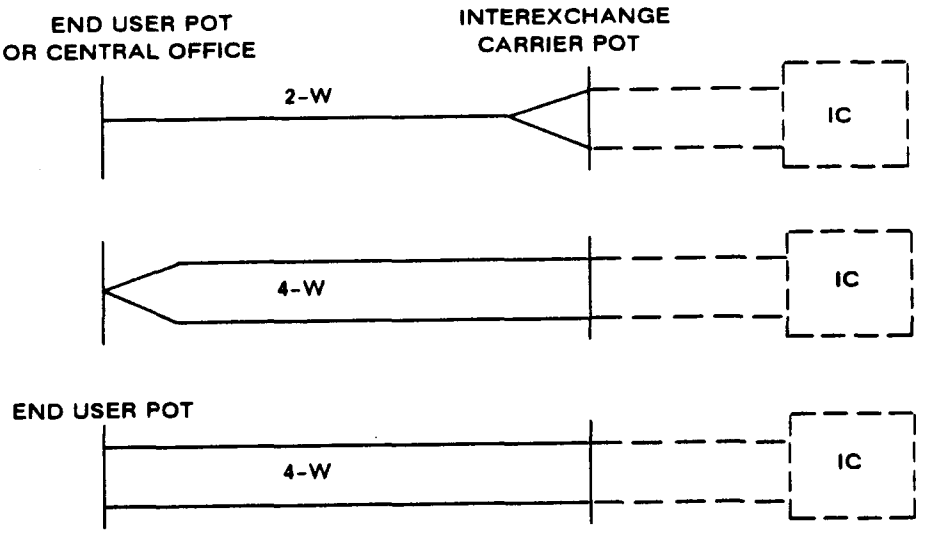


Fig. 9 - Typical Voice-Grade 7 Channel Configurations

2.26 A VG7 channel extends from the End User POT or from a Telephone Company central office, where a centrex switch is located, to the Interexchange Carrier POT. The transmission interface is 2- or 4-wire at the End User, 2-wire at the central office, and 4-wire at the Interexchange Carrier end. This channel will support effective 2-wire or effective 4-wire transmission.

Application

2.27 Voice Grade 7 is suitable for services such as:

- Centrex Off-Premises Station Line
- Long Distance Terminal Trunk
- PBX Off-Premises Station Line
- Tie Trunk
- Foreign Exchange Trunk (Closed End)
- Voice Grade Data Connecting Facility
- Foreign Exchange Line (Closed End)
- Off-Network Equivalent Service.

Acceptance and Immediate Action Tests - Voice Grade 7 (Table I)

2.28 Table I contains test parameters, test descriptions and limits for Voice Grade 7 channels without C or DA conditioning.

Note: See Table X (Parts 1-3) for tests on channels with optional conditioning. Table Y lists the tests and limits for channels with the Data Capability option.

TABLE I

ACCEPTANCE AND IMMEDIATE ACTION TESTS FOR VOICE-GRADE 7

WITHOUT OPTIONAL CONDITIONING

PARAMETER (Notes 1,2 & 3)	ACCEPTANCE LIMIT	IMMEDIATE ACTION LIMIT
1. LOSS	Measure (and record) 1004 Hz loss. LIMIT: ±1.0 dB of EML	Measure (and record) 1004 Hz loss. LIMIT: ±1.5 dB of EML
2. SLOPE	See Table R for limits.	See Table R for limits.
3. C- MESSAGE NOISE	See Table T for limits.	See Table T for limits.
4. C-NOTCHED NOISE (-13 dBm0 holding tone)	32 dB Minimum S/N Ratio or Maximum 45 dBrnc0	30 dB Minimum S/N Ratio or Maximum 47 dBrnc0
5. IMPULSE NOISE (Billable)	≤15 counts in 15 minutes @ 65 dBrnc0	≤15 counts in 15 minutes @ 67 dBrnc0
6. ENVELOPE DELAY DISTORTION (Billable)	804 - 2604 Hz = 650 μsec.	804 - 2604 Hz = 700 μsec.
7. PHASE JITTER Degrees (Billable)	20 - 304 Hz = 4° peak to peak 4 - 304 Hz = 9° peak to peak	20 - 304 Hz = 5° peak to peak 4 - 304 Hz = 10° peak to peak
8. INTERMODULATION DISTORTION (Billable)	R2 ≥35 dB R3 ≥42 dB	R2 ≥33 dB R3 ≥40 dB
9. FREQUENCY SHIFT (Billable)	≤1 Hz	≥1 Hz
10. ECHO CONTROL (Billable)	See Table AA.	See Table AA.
11. OPERATIONAL SIGNALING	BR 313-300-101	
EXPECTED PERFORMANCE (-13 dBm0 Holding tone)		
GAIN HITS PHASE HITS DROP OUTS (Note 3)	≤2 in 15 min. ≤2 in 15 min. ≤1 in 15 min.	≥3 dB ≥20 degrees ≥12 dB

Notes:

1. Both Slope and Attenuation Distortion are ways of measuring frequency response (which is a tariffed parameter). Slope is adequate for acceptance tests and is specified as a non-billable test. Attenuation Distortion testing is available at the customer request but is billable. See Table S for the test frequencies to be used when testing for Slope and Attenuation Distortion.
2. Billable tests should be made only at the customers request as an acceptance test.
3. Gain Hits, Phase Hits, and Drop Outs are expected to be measured primarily during trouble investigations.

H. Voice Grade 8 (Service Code LJ)

General

2.29 Voice Grade 8 (VG8) channels are suitable for the access segment of trunk-type voice grade data circuits. Figure 10 contains typical configurations of Voice Grade 8 channels.

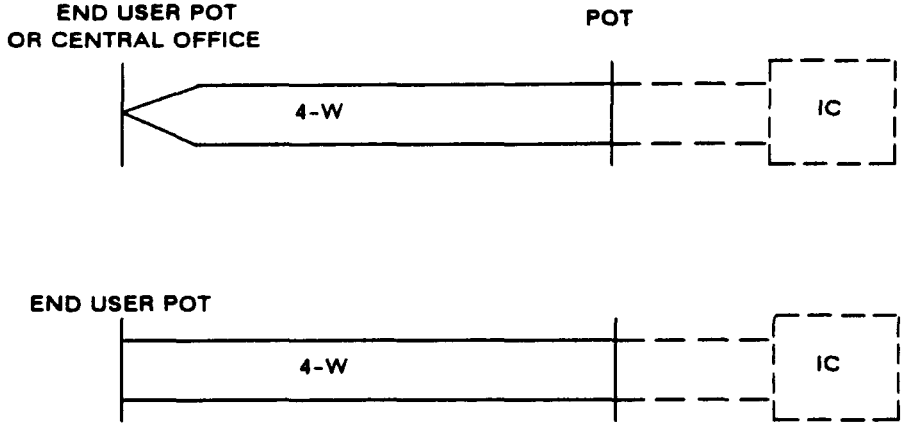


Fig. 10 - Typical Voice-Grade 8 Channel Configurations

2.30 A VG8 channel extends from the End User POT or from a Telephone Company central office to the Interexchange Carrier POT. The transmission interface is 2- or 4-wire at the End User, 2-wire at the central office, and 4-wire at the Interexchange Carrier end. This channel will support effective 4-wire transmission.

Application

2.31 Voice Grade 8 is suitable for services such as:

- SSN Access Line
- SSN Station Line

Acceptance and Immediate Action Tests - Voice Grade 8 (Table J)

2.32 Table J contains the test parameters, test descriptions and limits for Voice Grade 8 channels without C-conditioning.

Note: See Table X (Parts 1-3) for details of tests on channels with optional conditioning.

TABLE J

ACCEPTANCE AND IMMEDIATE ACTION TESTS FOR VOICE-GRADE 8

WITHOUT OPTIONAL CONDITIONING

PARAMETER (Notes 1,2, & 3)	ACCEPTANCE LIMIT	IMMEDIATE ACTION LIMIT
1. LOSS	Measure (and record) 1004 Hz loss. LIMIT: ±1.0 dB of EML	Measure (and record) 1004 Hz loss. LIMIT: ±1.5 dB of EML
2. SLOPE	See Table R for limits.	See Table R for limits.
3. C- MESSAGE NOISE	See Table T for limits.	See Table T for limits.
4. C-NOTCHED NOISE (-13 dBm0 holding tone)	34 dB Minimum S/N Ratio or Maximum 43 dBrnc0	32 dB Minimum S/N Ratio or Maximum 45 dBrnc0
5. IMPULSE NOISE (Billable)	≤15 counts in 15 minutes @ 65 dBrnc0	≤15 counts in 15 minutes @ 67 dBrnc0
6. ENVELOPE DELAY DISTORTION (Billable)	804 - 2604 Hz = 650 μsec.	804 - 2604 Hz = 700 μsec.
7. PHASE JITTER (Degrees) (Billable)	20 - 300 Hz = 3° peak to peak 4 - 304 Hz = 8° peak to peak	20 - 300 Hz = 4° peak to peak 4 - 304 Hz = 9° peak to peak
8. INTERMODULATION DISTORTION (Billable)	R2 ≥46 dB R3 ≥49 dB	R2 ≥45 dB R3 ≥48 dB
9. FREQUENCY SHIFT (Billable)	≤1 Hz	≥1 Hz
10. ECHO CONTROL (Billable)	See Table AA. (EFF. 4-wire)	See Table AA. (EFF. 4-wire)
11. OPERATIONAL SIGNALING	BR 313-300-101	

See Notes next page

TABLE J

(Continued)

ACCEPTANCE AND IMMEDIATE ACTION TESTS FOR VOICE-GRADE 8

WITHOUT OPTIONAL CONDITIONING

EXPECTED PERFORMANCE (-13 dBm0 holding tone)		
GAIN HITS	≤2 in 15 min.	≥3 dB
PHASE HITS	≤2 in 15 min.	≥20 degrees
DROP OUTS (Note3)	≤1 in 15 min.	≥12 dB

Notes:

1. Both Slope and Attenuation Distortion are ways of measuring frequency response (which is a tariffed parameter). Slope is adequate for acceptance tests and is specified as a non-billable test. Attenuation Distortion testing is available at the customer request but is billable. See Table S for the test frequencies to be used when testing for Slope and Attenuation Distortion.
2. Billable tests should be made only at the customers request as an acceptance test.
3. Gain Hits, Phase Hits, and Drop Outs are expected to be measured primarily during trouble investigations.

I. Voice Grade 9 (Service Code LK)

General

2.33 Voice Grade 9 (VG9) channels are suitable for the access segment of simultaneous 2-way voice grade data circuits. A typical configuration is shown in Figure 11.

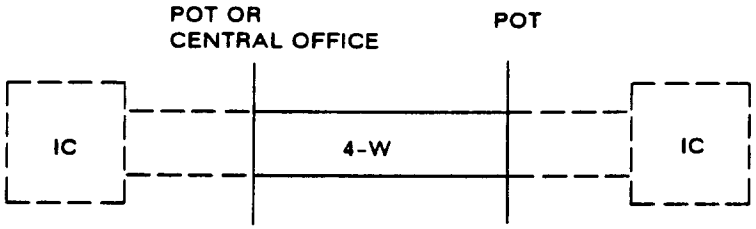


Fig. 11 - Typical Voice-Grade 9 Channel Configurations

2.34 A VG9 channel extends from the Interexchange Carrier POT to another Interexchange Carrier POT in the same LATA or between the Interexchange Carrier POT and a Telephone Company central office that serves a switched service network switch. The transmission interfaces are 4-wire. This channel will support effective 4-wire transmission.

Application

2.35 Voice Grade 9 is suitable for use as part of the facilities required to provide switched service network intermachine trunks.

Acceptance and Immediate Action Tests - Voice Grade 9 (Table K)

2.36 Table K contains the test parameters, test descriptions and limits for Voice Grade 9 channels without C conditioning.

Note: See Table X (Parts 1-3) for tests on channels with optional conditioning.

TABLE K

ACCEPTANCE AND IMMEDIATE ACTION TESTS FOR VOICE-GRADE 9

WITHOUT C CONDITIONING

PARAMETER (Notes 1,2, & 3)	ACCEPTANCE LIMIT	IMMEDIATE ACTION LIMIT
1. LOSS	Measure (and record) 1004 Hz loss. LIMIT: ±1.0 dB of EML	Measure (and record) 1004 Hz loss. LIMIT: ±1.5 dB of EML
2. SLOPE	See Table R for limits.	See Table R for limits.
3. C- MESSAGE NOISE	See Table T for limits.	See Table T for limits.
4. C-NOTCHED NOISE (-13 dBm0 holding tone)	36 dB Minimum S/N Ratio or Maximum 41 dBrnc0	34 dB Minimum S/N Ratio or Maximum 43 dBrnc0
5. IMPULSE NOISE (Billable)	≤15 counts in 15 minutes @ 65 dBrnc0	≤15 counts in 15 minutes @ 67 dBrnc0
6. ENVELOPE DELAY DISTORTION (Billable)	804 - 2604 Hz = 650 μsec.	804 - 2604 Hz = 700 μsec.
7. PHASE JITTER (Degrees) (Billable)	20 - 304 Hz = 2.5° peak to peak 4 - 304 Hz = 7° peak to peak	20 - 304 Hz = 3° peak to peak 4 - 304 Hz = 8° peak to peak
8. INTERMODULATION DISTORTION (Billable)	R2 ≥51 dB R3 ≥55 dB	R2 ≥50 dB R3 ≥54 dB
9. FREQUENCY SHIFT (Billable)	≤ 1 Hz	≥1 Hz
10. OPERATIONAL SIGNALING	BR 313-300-101	
EXPECTED PERFORMANCE (-13 dBm0 Holding Tone)		
GAIN HITS PHASE HITS DROP OUTS (Note 3)	≤2 in 15 min. ≤2 in 15 min. ≤1 in 15 min.	≥3 dB ≥20 degrees ≥12 dB

Notes:

1. Both Slope and Attenuation Distortion are ways of measuring frequency response (which is a tariffed parameter). Slope is adequate for acceptance tests and is specified as a non-billable test. Attenuation Distortion testing is available at the customer request but is billable. See Table S for the test frequencies to be used when testing for Slope and Attenuation Distortion.
2. Billable tests should be made only at the customers request as an acceptance test.
3. Gain Hits, Phase Hits, and Drop Outs are expected to be measured primarily during trouble investigations.

J. Voice Grade 10 (Service Code LN)

General

2.37 Voice Grade 10 (VG10) channels are suitable for specialized simultaneous 2-way voice grade analog data circuits that extends Digital Data access service into areas that do not have digital line facilities. A typical configuration is shown in Figure 12.

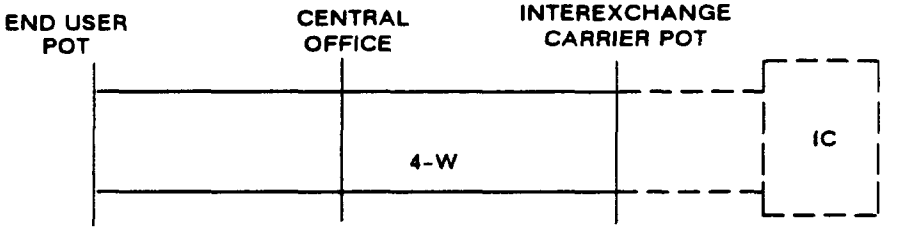


Fig. 12 - Typical Voice-Grade 10 Channel Configuration

2.38 A VG10 channel extends from the End User POT to the Interexchange Carrier POT or from the End User POT to a Telephone Company central office for connection to digital data service. The transmission interfaces are 4-wire. This channel will support effective 4-wire transmission.

Application

2.39 Voice Grade 10 is suitable for providing digital data off-network extension service.

Acceptance and Immediate Action Tests - Voice Grade 10 (Table L)

2.40 Table L contains test parameters for Voice Grade 10 channels without C or DA conditioning.

> ***Note:*** See Table X (Parts 1-3) for tests on channels with optional conditioning. Table Y lists the tests and limits for channels with the Data Capability option.

TABLE L

ACCEPTANCE AND IMMEDIATE ACTION TESTS FOR VOICE GRADE 10

WITHOUT C OR DA CONDITIONING

PARAMETER (Notes 1,2, & 3)	ACCEPTANCE LIMIT	IMMEDIATE ACTION LIMIT
1. LOSS	Measure (and record) 1004 Hz loss. LIMIT: ±1.0 dB of EML	Measure (and record) 1004 Hz loss. LIMIT: ±4.0 dB of EML
2. SLOPE	See Table R for limits.	See Table R for limits.
3. C- MESSAGE NOISE	See Table T for limits.	See Table T for limits.
4. C-NOTCHED NOISE (-13 dBm0 holding tone)	26 dB Minimum S/N Ratio or Maximum 51 dBrnc0	24 dB Minimum S/N Ratio or Maximum 53 dBrnc0
5. IMPULSE NOISE (Billable)	≤15 counts in 15 minutes @ 69 dBrnc0	≤15 counts in 15 minutes @ 71 dBrnc0
6. ENVELOPE DELAY DISTORTION (Billable)	804 - 2604 Hz = 1700 μsec.	804 - 2604 Hz = 1750 μsec.
7. PHASE JITTER (Degrees) (Billable)	20 - 304 Hz = 8° peak to peak 4 - 304 Hz = 13° peak to peak	20 - 304 Hz = 10° peak to peak 4 - 304 Hz = 15° peak to peak
8. INTERMODULATION DISTORTION (Billable)	R2 ≥29 dB R3 ≥34 dB	R2 ≥27 dB R3 ≥32 dB
9. FREQUENCY SHIFT (Billable)	≤2 Hz	≥3 Hz
EXPECTED PERFORMANCE (-13 dBm0 holding tone)		
GAIN HITS PHASE HITS DROP OUTS (Note 3)	≤2 in 15 min. ≤2 in 15 min. ≤1 in 15 min.	≥3 dB ≥20 degrees ≥12 dB

Notes:

1. Both Slope and Attenuation Distortion are ways of measuring frequency response (which is a tariffed parameter). Slope is adequate for acceptance tests and is specified as a non-billable test. Attenuation Distortion testing is available at the customer request but is billable. See Table S for the test frequencies to be used when testing for Slope and Attenuation Distortion.
2. Billable tests should be made only at the customers request as an acceptance test.
3. Gain Hits, Phase Hits, and Drop Outs are expected to be measured primarily during trouble investigations.

K. Voice Grade 11 (Service Code LP)

General

2.41 Voice Grade 11 (VG11) channels are suitable for the access segment of specialized voice grade telephoto/facsimile circuits. Typical configurations are shown in Figure 13.

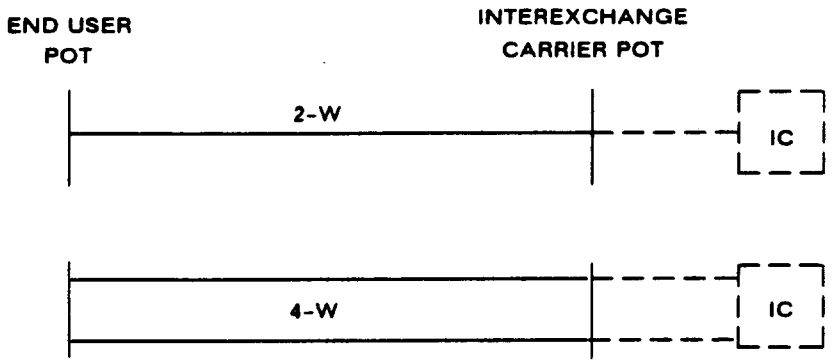


Fig. 13 - Typical Voice-Grade 11 Channel Configurations

2.42 A VG11 channel extends from the End User POT to the Interexchange Carrier POT. The transmission interfaces may be 2-wire or 4-wire at either end. This channel will support effective 2-wire or effective 4-wire transmission.

Application

2.43 Voice Grade 11 is suitable for use as part of the facilities required to provide telephoto/facsimile service.

Acceptance and Immediate Action Tests - Voice Grade 11 (Table M)

2.44 Table M contains the test parameters, test descriptions and limits for VG11 channels without T conditioning.

Note: See Table Z for tests on channels with optional T conditioning.

TABLE M

ACCEPTANCE AND IMMEDIATE ACTION TESTS

VOICE GRADE 11 WITHOUT T CONDITIONING

PARAMETER (Notes 1 & 2)	ACCEPTANCE LIMIT	IMMEDIATE ACTION LIMIT
1.LOSS	Measure (and record) 1004 Hz LIMIT: ±1.0 dB	Measure (and record) 1004 Hz LIMIT: ±1.5 dB
2. ATTENUATION DISTORTION	See Table R for limits.	See Table R for limits.
3. C-MESSAGE NOISE	See Table T for limits.	See Table T for limits.
4. C-NOTCHED NOISE (-13 dBm0 holding tone)	32 dB Minimum S/N Ratio or Maximum 45 dBrnc0	30 dB Minimum S/N Ratio or Maximum 47 dBrnc0
5. IMPULSE NOISE (Billable)	≤15 counts in 15 minutes at 65 dBrnc0	≤15 counts in 15 minutes at 67 dBrnc0
6. ENVELOPE DELAY DISTORTION (Billable)	804-2604 Hz = 650 μsec.	804-2604 Hz = 700 μsec.
7. PHASE JITTER (Degrees) (Billable)	20-304 Hz = 4° peak to peak 4-304 Hz = 9° peak to peak	20-304Hz = 5° peak to peak 4-304 Hz = 10° peak to peak
8. INTERMODULATION DISTORTION (Billable)	R2 ≥35 dB R3 ≥42 dB	R2 ≥33 dB R3 ≥40 dB
9. FREQUENCY SHIFT (Billable)	≤ 1 Hz	≥1 Hz

See Notes next page

TABLE M

(Continued)

ACCEPTANCE AND IMMEDIATE ACTION TESTS

VOICE GRADE 11 WITHOUT T CONDITIONING

PARAMETER	EXPECTED PERFORMANCE (-13 dBm0 holding tone)	
10. GAIN HITS	≤2 in 15 min.	≥3 dB
PHASE HITS	≤2 in 15 min.	≥20 degrees
DROP OUTS (Billable)	≤1 in 15 min.	≥12 dB

Notes:

1. Billable tests should be made only at the customers request as an acceptance test.
2. Gain Hits, Phase Hits, and Drop Outs are expected to be measured primarily during trouble investigations.

L. Voice Grade 12 (Service Code LR)

General

2.45 Voice Grade 12 (VG12) channels are suitable for the access segment of specialized voice grade private line audio tone protective relaying circuits. Figure 14 contains three typical configurations of VG12 channels.

2.46 A VG12 channel extends from the End User POT to the Interexchange Carrier POT. The transmission interface may be 2-wire or 4-wire at either end. This channel can provide one-way effective 2-wire transmission or 2-way, 4-wire transmission.

Application

2.47 Voice Grade 12 is suitable for use as part of facilities required to provide audio tone protective relaying circuits for the electric power industry.

Acceptance and Immediate Action Tests - Voice Grade 12 (Table N)

2.48 Table N contains the test parameters, test descriptions and limits for VG12 channels.

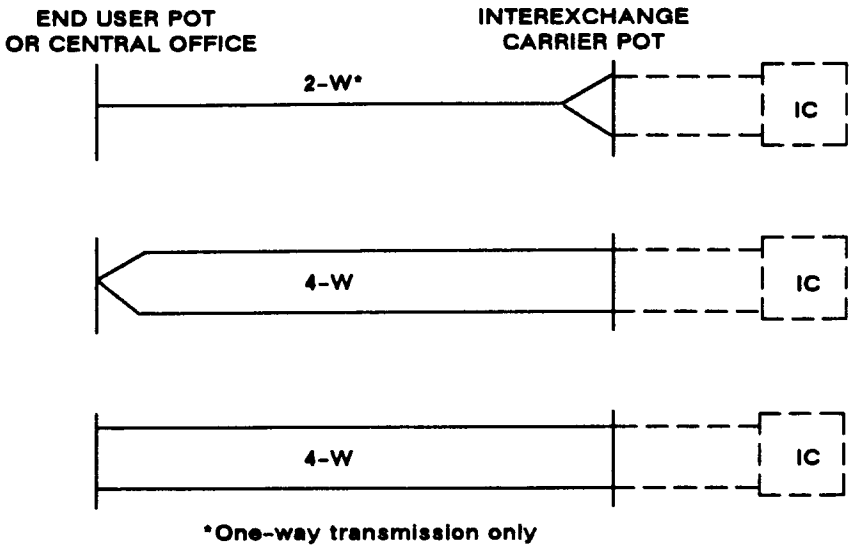
TABLE N

ACCEPTANCE AND IMMEDIATE ACTION TESTS FOR VOICE GRADE 12

PARAMETER (Notes 1,2, & 3)	ACCEPTANCE LIMIT	IMMEDIATE ACTION LIMIT
1. LOSS	Measure (and record) 1004 Hz loss. LIMIT: ±1.0 dB of EML	Measure (and record) 1004 Hz loss. LIMIT: ±1.5 dB of EML
2. ATTENUATION DISTORTION	See Table R for limits.	See Table R for limits.
3. C- MESSAGE NOISE	See Table T for limits.	See Table T for limits.
4. C-NOTCHED NOISE (-13 dBm0 holding tone)	34 dB Minimum S/N Ratio or Maximum 43 dBrnc0	32 dB Minimum S/N Ratio or Maximum 45 dBrnc0
5. IMPULSE NOISE (Billable)	≤15 counts in 15 minutes @ 65 dBrnc0	≥15 counts in 15 minutes @ 67 dBrnc0
6. ENVELOPE DELAY DISTORTION (Billable)	804 - 2604 Hz = 650 μsec.	804 - 2604 Hz = 715 μsec.
7. FREQUENCY SHIFT (Billable)	≤1 Hz	≥1 Hz
EXPECTED PERFORMANCE (-13 dBm0 holding tone)		
GAIN HITS PHASE HITS DROP OUTS (Note 3)	≤2 in 15 min. ≤2 in 15 min. ≤1 in 25 min.	≥3 dB ≥20 degrees ≥12 dB

Notes:

1. Both Slope and Attenuation Distortion are ways of measuring frequency response (which is a tariffed parameter). Slope is adequate for acceptance tests and is specified as a non-billable test. Attenuation Distortion testing is available at the customer request but is billable. See Table S for the test frequencies to be used when testing for Slope and Attenuation Distortion.
2. Billable tests should be made only at the customers request as an acceptance test.
3. Gain Hits, Phase Hits, and Drop Outs are expected to be measured primarily during trouble investigations.



*One-way transmission only

Fig. 14 - Typical Voice-Grade 12 Channel Configurations

M. Voice Grade C (Service Code LQ)

General

2.49 Voice Grade C service may be used of two point channels including end links and mid-links of special access service. Voice Grade C service may be *"Customized"* by the selection of the desired technical specification from the technical specifications of Voice-Grades 1 through 12.

2.50 Since the specifications for Voice Grade C services may be selected from those of Voice-Grades 1 through 12, it is necessary to determine which combinations have been requested and then refer to the appropriate Voice Grade tables in this practice for the limits that apply.

2.51 If additional conditioning has been selected for Voice-Grade C, such as C-conditioning, T-Conditioning, DA-Conditioning, or improved distortion, the following tables may be consulted for appropriate limits.

- Table X (Part 1) - For C-Conditioning (associated with Voice-Grades 5,6,7,8, 9, and 10).
- Table X (Parts 2 and 3) - For Improved Attenuation and Envelope Delay Distortion
- Table Y - For DA-Conditioning (associated with Voice-Grades 6, 7, and 10)
- Table Z - For T-Conditioning (associated with Voice-Grade 11)

N. Jurisdictionally Interstate Access Service

2.52 Jurisdictionally Interstate Service (JIS) is an IntraLATA End-User to End-User service that is:

(1) Interstate where a LATA boundary crosses a State boundary,

(2) Interstate corridor service,

(3) International service across United States boundaries,

(4) IntraLATA service that may carry interstate traffic either occasionally or predominately by being connected to interstate circuits.

JI Service Description, Test Parameters and Limits (Table O)

2.53 Voice-Grade 2 JI service provides voice grade transmission capability between the End-User POTs. This service is provided totally within a LATA. Usable frequencies are nominally 304 to 3004 Hz. The service will support either effective 2 or 4 wire transmission. Typical configurations are shown in Figure 15.

2.54 Table O (Part 1) contains the test parameters, test descriptions and limits for Voice Grade 2 Jurisdictionally Interstate Service.

2.55 Voice-Grade 3 JIS service utilizes frequencies nominally 304 to 3004 Hz. The Service extends from End-User to End-User POT. This service will support effective 2- or 4-wire transmission. Voice-Grade 3 JIS service is suitable for end to end voice trunk circuits. Typical configurations are shown in Figure 15.

2.56 Table O (Part 2) contains the test parameters, test descriptions, and limits for Voice-Grade 3 J1 service.

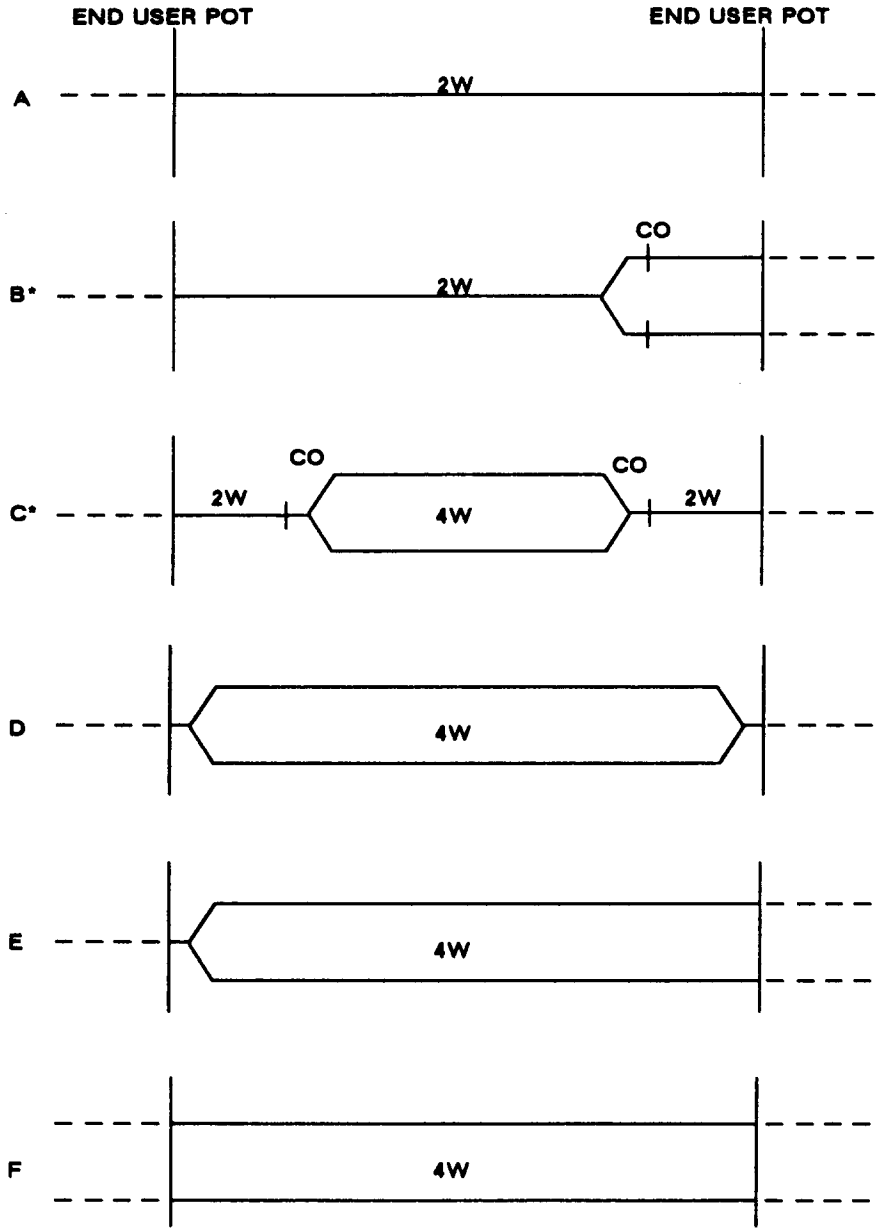
2.57 Voice-Grade 7 JI service utilizes frequencies nominally 304 to 3004 Hz. The service extends from End-User to End-User POT. The service will support effective 2- or 4-wire transmission and is suitable for end-to-end voice grade data. Typical configurations are found in Figure 15.

2.58 Table O (Part 3) contains the test parameters, test descriptions, and limits for Voice-Grade 7 JI service. The C-Conditioning and data capability option limits for this service are contained in Table O (Part 6).

2.59 Voice-Grade 10 JI service utilizes frequencies nominally 304 to 3004 Hz. The service extends from End-User to End-User POT and is suitable for voice grade data transmission. Voice-Grade 10 JI service will support one way transmission (effective 2-wire) and two-way transmission (4-wire). Typical configurations are shown in Figure 15.

2.60 Transmission parameters, descriptions and limits for Voice-Grade 10 JI services are shown in Table O (Part 4). If C-Conditioning or the data capability option has been specified for Voice-Grade 10 JI, the limits are contained in Table O (Part 6).

2.61 Parameters/Specifications for Voice-Grade 4JI and Voice-Grade 12JI are the same as Access Voice Grade 4 and 12 respectfully and as such are not given in this practice.



* Not Applicable to VG 10 Service

Fig. 15 - Jurisdictionally Interstate Access Service Configurations

TABLE O

(Part 1)

**MAXIMUM LIMITS FOR VOICE-GRADE 2
JURISDICTIONALLY INTERSTATE SERVICE**

PARAMETER	FREQUENCY	MAXIMUM LIMIT (Note)		
1. LOSS DEVIATION	1004 Hz	±4 dB from EML		
2. 3-TONE SLOPE	404-2804 Hz	-3 to +12 dB		
3. ATTENUATION DISTORTION	504-2504 Hz 304-3004 Hz	-2 to +8 dB -3 to +12 dB		
	FACILITY MILES			
4. C-MESSAGE NOISE	0-200	201-400	401-1000	
dBrnc0	40	42	44	
5. ECHO CONTROL	See Table O (Part 5) for limits			

Note: Minus (-) means less loss, plus (+) means more loss.

TABLE O

(Part 2)

**MAXIMUM LIMITS FOR VOICE-GRADE 3
JURISDICTIONALLY INTERSTATE SERVICE**

PARAMETER	FREQUENCY	MAXIMUM LIMIT (Note)		
1. LOSS DEVIATION	1004 Hz	±4 dB from EML		
2. 3-TONE SLOPE	404-2804 Hz	-2 to +6 dB		
3. ATTENUATION DISTORTION	404-2804 Hz 304-3004 Hz	-2 to +6 dB -3 to +12 dB		
	FACILITY MILES			
4. C-MESSAGE NOISE	0-200	201-400	401-1000	
dBrnc0	40	42	44	
5. ECHO CONTROL	See Table O (Part 5) for limits			

Note: Minus (-) means less loss, plus (+) means more loss.

TABLE O

(Part 3)

**MAXIMUM LIMITS FOR VOICE-GRADE 7
JURISDICTIONALLY INTERSTATE SERVICE**

PARAMETER	FREQUENCY	MAXIMUM LIMIT (Note 1)
1. LOSS DEVIATION	1004 Hz	±4 dB from EML
2. 3-TONE SLOPE	404-2804 Hz	-2 to +5 dB
3. ATTENUATION DISTORTION	404-2804 Hz 304-3004 Hz	-2 to +5 dB -3 to +12 dB
4. C-MESSAGE NOISE	FACILITY MILES	
	0-200	201-400 | 401-1000
dBrnc0	40	42 | 44
5. ECHO CONTROL	See Table O (Part 5) for limits	
6. C-NOTCHED NOISE (-13 dBm0 holding tone)	25 dB Minimum S/N Ratio or Maximum 52 dBrnc0	
7. ENVELOPE DELAY DISTORTION	804-2604 Hz 1250 μsec.	
8. IMPULSE NOISE (-13 dBm0 holding tone)	≤15 counts in 15 minutes @ 71 dBrnc0	
9. INTERMODULATION DISTORTION (Note 2)	R2 ≥28 dB R3 ≥35 dB	
10. PHASE JITTER (Degrees peak to peak)	20 to 304 Hz = 8° 4 to 304 Hz = 12°	
11. FREQUENCY SHIFT	≥3 Hz	
12. PHASE HITS GAIN HITS DROP OUTS (-13 dBm0 holding tone) (Note 3)	8 in 15 min. ≥20 degrees 8 in 15 min. ≥3 dB 2 in 15 min. ≥12 dB	

Notes :

1. Minus (-) means less loss, plus (+) means more loss.
2. R2 = 2nd order product, R3 = 3rd order product
3. Gain Hits, Phase Hits, and Drop Outs are expected to be measured primarily during trouble investigation.

TABLE O

(Part 4)

**MAXIMUM LIMITS FOR VOICE-GRADE 10
JURISDICTIONALLY INTERSTATE SERVICE**

PARAMETER	FREQUENCY	MAXIMUM LIMIT (Note 1)
1. LOSS DEVIATION	1004 Hz	±4 dB from EML
2. 3-TONE SLOPE	404-2804 Hz	-2 to +10 dB
3. ATTENUATION DISTORTION	504-2804 Hz 404-2804 Hz 304-3004	-2 to +8 dB -2 to +10 dB -3 to +12 dB
4. C-MESSAGE NOISE	FACILITY MILES	
	0-200	201-400 / 401-1000
dBrnc0	40	42 / 44
5. ECHO CONTROL	See Table O (Part 5) for limits	
6. C-NOTCHED NOISE (-13dBm0 holding tone)	24 dB S/N Ratio or 53 dBrnc0	
7. ENVELOPE DELAY DISTORTION	804 to 2604 Hz	1750 μsec.
8. IMPULSE NOISE (-13 dBm0 Holding Tone)	≤15 counts in 15 minutes at 71 dBrnc0	
9. INTERMODULATION DISTORTION	R2 ≥27 dB R3 ≥32 dB	
10. PHASE JITTER (Degrees peak to peak)	20 to 304 Hz = 10° 4 to 304 Hz = 15°	
11. FREQUENCY SHIFT	≥3 Hz	
12. PHASE HITS GAIN HITS DROP OUTS (-13 dBm0 holding tone) (Note 3)	8 in 15 min. ≥20 degrees 8 in 15 min. ≥3 dB 2 in 15 min. ≥12 dB	

Notes:

1. Minus (-) means less loss, plus (+) means more loss.
2. R2 = 2nd order product, R3 = 3rd order product.
3. Gain Hits, Phase Hits, and Drop Outs are expected to be measured primarily during trouble investigations.

TABLE O

(Part 5)

MINIMUM ECHO CONTROL LIMITS FOR JURISDICTIONALLY INTERSTATE SERVICE

FACILITY (Note)	INTERFACE BEING MEASURED	ERL	SRL
Effective 2 wire	2-wire or 4 wire	6	3
	2-wire or 4-wire with improved RL option	13	8
4-wire	2-wire or 4-wire	18	12

Note: An effective 2-wire facility may be all 2-wire or contain some 4-wire portions (such as carrier with 2-wire extensions). A 4-wire facility must be all 4-wire, however, one or both interfaces may be 2-wire.

TABLE O

(Part 6)

CONDITIONING OPTION LIMITS FOR VOICE-GRADES 7 AND 10 JURISDICTIONALLY INTERSTATE SERVICE

C-CONDITIONING OPTION		
PARAMETER	MAXIMUM LIMIT	
1. ATTENUATION DISTORTION (Note 1)	504-2804 Hz 304-3004 Hz	-1 to +3 dB -2 to +6 dB
2. ENVELOPE DELAY DISTORTION	1004-2604 Hz 604-2604 Hz 504-2804 Hz	500 μsec. 1500 μsec. 3000 μsec.
DATA CAPABILITY OPTION		
PARAMETER	MINIMUM LIMIT	
1. SIGNAL TO C-NOTCH NOISE RATIO	28 dB (-13 dBm0 holding tone)	
2. INTERMODULATION DISTORTION (Note 2)	R2 ≥35 dB R3 ≥40 dB	

Notes :

1. Minus (-) means less loss, plus (+) means more loss.
2. R2 = 2nd order product, R3 = 3rd order product

3. SWITCHED ACCESS CHANNELS-DESCRIPTION, ACCEPTANCE, AND IMMEDIATE ACTION TEST REQUIREMENTS

A. WATS Access Line

General

3.01 A WATS access line provides a connection between a End User POT or a centrex central office switch to a central office switch capable of performing screening functions for 800 service, WATS, or other similar services. The WATS access line is provided only with feature groups C and D switched access services. Figure 16 contains typical configurations for WATS access lines.

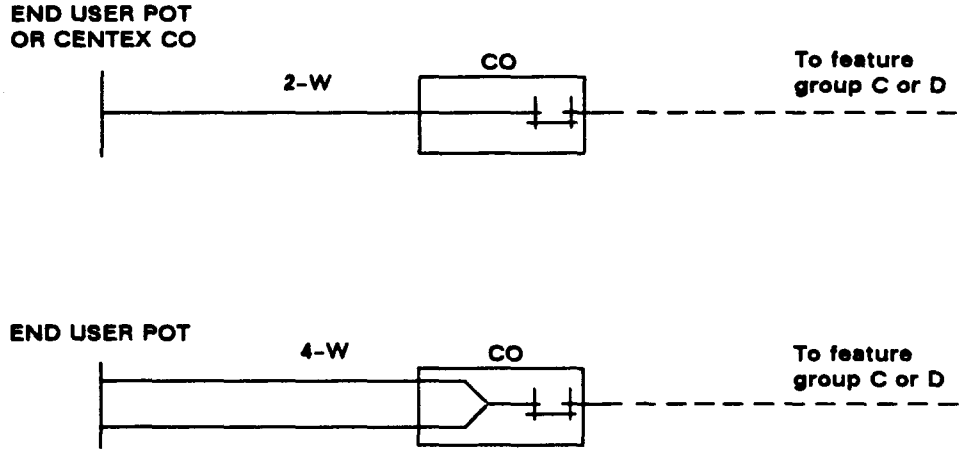


Fig. 16 - Typical WATS Access Line Configuration

3.02 A WATS access line channel extends from the End User POT or from a centrex central office switch to a line or trunk side termination at a Telephone Company central office switch. The transmission interface may be 2- or 4- wire at the End User, this channel will support effective 2- or 4-wire transmission.

Application

3.03 The WATS access lines provide the closed end of an 800 service or other WATS-type service.

Acceptance and Immediate Action Tests - WATS Access Line (Table P)

3.04 Table P contains the test parameters, test descriptions and limits for WATS access lines.

TABLE P

ACCEPTANCE AND IMMEDIATE ACTION TESTS FOR WATS ACCESS LINES

PARAMETER (Notes 1 and 2)	ACCEPTANCE LIMIT	IMMEDIATE ACTION LIMIT
1. LOSS (a) 2-wire (b) 4-wire	 EML ±1 dB EML ±1 dB	 EML ±4 dB EML ±3 dB
2. SLOPE	See Table R for limits.	See Table R for limits.
3. C- MESSAGE NOISE	See Table U for limits.	See Table U for limits.
4. C-NOTCHED NOISE * (-13 dBm0 holding tone)		30 dB S/N Ratio or maximum 47 dBrnc0
5. IMPULSE NOISE * (Billable)		≤15 counts in 15 minutes @ 67 dBrnc0 (13 dBm0 holding tone)
6. ENVELOPE DELAY * DISTORTION (Billable)		604 - 2804 Hz = 1000 μsec. 1004-2404 Hz = 500 μsec.
7. PHASE JITTER * (Billable)		4-304 Hz 7 ° peak to peak
8. INTERMODULATION * DISTORTION		R2 ≥31 dB R3 ≥34 dB
9. FREQUENCY * SHIFT (Billable)		≥2 Hz
10. OPERATIONAL SIGNALING	BR 313-300-101	

See notes on next page.

TABLE P

(Continued)

ACCEPTANCE AND IMMEDIATE ACTION LIMITS FOR WATS ACCESS LINES

11. ECHO CONTROL LIMITS FOR WATS ACCESS LINES						
TRANSMISSION AND TEST CONFIGURATION		TYPE OF MEASUREMENT	AL (dB)		IAL (dB)	
MEASURE AT	TERMINATE AT		ERL	SRL	ERL	SRL
Effective 2-wire transmission						
End User(2W)	CO (2W) Standard	RL	5.5	3	5	2.5
End User(2W)	CO (2W) Improved	RL	14	7	13	6
Effective 4-wire transmission						
End User(4W)	CO (2W)	ELEPL	19	12	15	9

* These limits are not provided by special conditioning, but are the limits that the WATS access lines should meet when testing is performed at the Interexchange Carriers request.

Notes:

1. Both Slope and Attenuation Distortion are ways of measuring frequency response (which is a tariffed parameter). Slope is adequate for acceptance tests and is specified as a non-billable test. Attenuation Distortion testing is available at the customer request but is billable. See Table S for the test frequencies to be used when testing for Slope and Attenuation Distortion.
2. Billable tests should be made only at the customers request as an acceptance test.

B. Feature Group A

General

3.05 Feature Group A channels provide a connection between an Interexchange Carrier POT and the first point of switching within a LATA (end office or tandem office). The first point of switching provides a line-side termination that is assigned a 7-digit (or more) telephone number. Typical configurations of Feature Group A channels are shown in Figure 17.

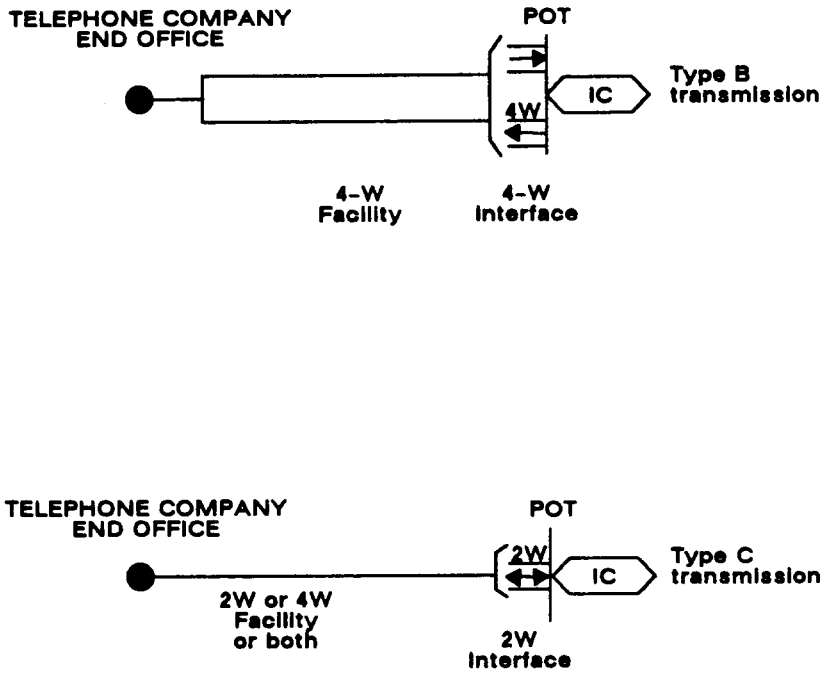


Fig. 17 - Typical Feature-Group A Configurations

3.06 A Feature Group A channel extends from the Interexchange Carrier POT to a line side termination in a Telephone Company central office that is the first point of switching within a LATA. The transmission interfaces are 2-wire at the central office and either 2- or 4-wire at the Interexchange Carrier POT. Transmission type B offers a 4-wire interface at the Interexchange Carrier end and effective 4-wire Telephone Company facilities. Transmission type C offers a 2-wire interface at each end and Telephone Company facilities may be either 2-wire, 4-wire, or both. Transmission parameters apply only between the Interexchange POT and the first point of switching.

Application

3.07 Feature Group A channels are suitable for FX service, off-net access lines.

Acceptance and Immediate Action Tests - Feature Group A Channels (Table Q)

3.08 Table Q contains the test parameters, test descriptions, and limits for Feature-Group A channels.

Note: Measurement required if facility consists of channel 1 or 12 of L-Multiplex.

TABLE Q

ACCEPTANCE AND IMMEDIATE ACTION LIMITS FOR FEATURE GROUP A CHANNELS

(See Notes 1 and 2)

VOICE PARAMETER	TYPE B 4-WIRE TERMINATING AT POT		TYPE C 2-WIRE TERMINATING AT POT	
(Note 3)	AL	IAL	AL	IAL
1. LOSS	EML ±0.7 dB	EML ±2.5 dB	±0.7 dB (with gain) ±1.2 dB (w/o gain)	±3.0 dB
2. ATTENUATION DISTORTION 404 - 2804 Hz 2804 Hz *	 -1.5 to +3.5 dB -1.0 to +2.5 dB	 -2.0 to +4.0 dB -1.0 to +3.5 dB	 -1.5 to +5.0 dB NA	 -2.0 to +5.5 dB NA
3. C-MESSAGE NOISE	See Table V for limits.		See Table V for limits.	
4. ECHO CONTROL ** ERL SRL	 17 12	 16 11	 NA NA	 NA NA

* These limits apply between the Telephone Company SF unit and the Interexchange Carrier POT when the Interexchange Carrier is provided an interface with SF signaling.

** Echo measurements are made at the Interexchange Carrier POT to the end office. Echo control is specified in dB as return loss at 2-wire interfaces (Type C) and as impedance balance at 4-wire interfaces (Type B).

Notes:

1. AL = Acceptance limits IAL = Immediate Action Limits
2. Type DB data parameter limits are listed in Table W. The Interexchange Carrier may request that these parameters are met to the first point of switching.
3. Attenuation Distortion loss deviation at 404 Hz and 2804 Hz relative to the AML at 1004 Hz.

C. Special Reference Tables

Attenuation Distortion-Acceptance and Immediate Action Limits (Table R)

3.09 Table R provides limits to be used for attenuation distortion tests specified in various tables in parts 2 and 3 of this practice.

TABLE R

ATTENUATION DISTORTION-ACCEPTANCE AND IMMEDIATE ACTION LIMITS FOR VOICE-GRADES 1-12

(See Notes 1 and 2)

CHANNEL	CHANNEL SERVICE CODE	FREQUENCY BAND (Hz)	IMMEDIATE ACTION LIMITS (dB) (Note 3)	ACCEPTANCE LIMIT (dB) (Note 3)
VG 1	LB	504-2504 404-2804 304-3004	-2.0 to +8.0 -2.0 to +10 -3.0 to +12	-1.5 to +7.5 -1.5 to +9.5 -2.5 to +11.5
VG 2	LC	404-2804 304-3004	-1.0 to +4.0 -1.0 to +5.0	-0.5 to +3.5 -0.5 to +4.5
VG 3	LD	404-2804 304-3004	-1.0 to +3.0 -1.0 to +5.0	-0.5 to +2.5 -0.5 to +4.5
VG 4	LE	304-504 504-2504 2504-2804 2804-3004	-1.0 to +3.5 -1.0 to +2.0 -1.0 to +3.0 -1.0 to +4.0	-0.5 to +3.0 -0.5 to +1.5 -0.5 to +2.5 -0.5 to +3.5
VG 5	LF	404-2804	-1.0 to +5.0	-0.5 to +4.5
VG 6	LG	504-2504 404-2804 304-3004	-1.0 to +3.0 -1.0 to +4.0 -1.0 to +5.0	-0.5 to +2.5 -0.5 to +3.5 -0.5 to +4.5
VG 7	LH	404-2804 304-3004	-1.0 to +2.0 -1.0 to +5.0	-0.5 to +1.5 -0.5 to +4.5
VG 8 & VG 9	LJ LK	404-2804 304-3004	-1.0 to +2.0 -1.0 to +5.0	-0.5 to +1.5 -0.5 to +4.5
VG 10	LN	504-2504 404-2804 304-3004	-2.0 to +8.0 -2.0 to +10 -3 to +12	-1.5 to +7.5 -1.5 to +9.5 -2.5 to +11.5
VG 11	LP	304-3004 1204-2604	-1.0 to +5.0 -1.0 to +1.0	-0.5 to +4.5 -0.5 to +0.5
VG 12	LR	504-2804 304-3004	-0.5 to +1.0 -1.0 to +2.5	-0.5 to +0.5 -0.5 to +2.0

TABLE R

(Continued)

ATTENUATION DISTORTION-ACCEPTANCE AND IMMEDIATE ACTION LIMITS FOR WATS ACCESS LINES

(See Notes 1 and 2)

CHANNEL	FREQUENCY BAND (Hz)	IMMEDIATE ACTION LIMITS (dB) (Note 3)	ACCEPTANCE LIMITS (dB) (Note 3)
WATS Acc.Lines			
2-W Standard	404-2804	-3.0 to +9.0	-2.5 to +8.0
2-W Improved	404-2804	-2.0 to +6.0	-1.5 to +5.0
4-W	404-2804	-1.0 to +4.5	-1.0 to +4.0

Notes:

1. All limits are the variation from the loss at 1004 Hz.
2. For all channels, the "+" limit means more loss and the "-" limit means less loss that at the reference frequency.
3. Tariff limits apply to all frequencies in the given band. Acceptance and immediate action limits are for either attenuation distortion or slope tests as required.

Reference Frequencies for Frequency Response Tests (Table S)

3.10 Table S provides a list of test frequencies to be used when making frequency response tests on Voice-Grades 1 through 12 and WATS Access lines.

TABLE S

FREQUENCY RESPONSE TEST FREQUENCIES FOR

VOICE-GRADES 1 - 12 AND WATS ACCESS LINES

CHANNEL	CHANNEL SERVICE CODE	TYPE OF MEASUREMENT	
		SLOPE (Note)	ATTENUATION DISTORTION (Note)
Voice-Grades 1,2,3,5,6,7 9, 10, WAL	LB, LC, LD LF, LG, LH LJ, LK, AND LN	404, 1004, 2804	304,404,504, 604, 804, 1004, 1204, 1404, 1604, 1804, 2004, 2204, 2404, 2504, 2604 *, 2704, 2804, and 3004 Hz
Voice-Grade 4	LE	404,1004,2804	
Voice-Grade 11	LP	404, 2204, 2804* Hz	
Voice-Grade 12	LR	304, 504, 1004, 2804, and 3004 Hz	
C-CONDITIONING (Voice-Grades 5 through 10)	LF to LK	404, 1004, 2804 Hz	All frequencies listed above plus 3204 Hz
T-CONDITIONING (Voice-Grade 11)	LP	304, 504, 1004, 3004, and 3204 Hz	

* If a channel uses SF signaling, do not measure 2604 Hz; rather, average the 2504 Hz and 2704 Hz measurements.

Note: The test requirements specify whether *Slope* or *Attenuation Distortion* is to be measured.

4. FACILITY DEPENDENT LIMITS

A. General

4.01 Many transmission parameters and test limits are facility dependent. The acceptance and immediate action limits given in part 2 of this practice should be met regardless of the channel facility with the exception of C message noise. Any facility related problems should have been corrected during preservice testing. (See BR 313-220-100 for preservice testing).

B. C-Message Noise Limits (Tables T through V)

4.02 Tables T through V list the acceptance limits for C message noise. These limits are dependent upon both facility makeup and channel length.

C. Data Transmission for Feature Group A (Table W)

4.03 Listed in Table W with the data transmission limits for Feature Group A are the Envelope Delay Distortion immediate action limits that are dependent on channel length.

D. Echo Control Limits

4.04 Echo control limits given in Table AA are dependent on facility configuration (2-wire or 4-wire etc.).

TABLE T

C-MESSAGE NOISE
ACCEPTANCE AND IMMEDIATE ACTION LIMITS
FOR VOICE GRADE 1-12 AND C

Facility Combination	Facility Length (Miles)									
	Acceptance Limits (AL) Immediate Action Limits (IAL)									
	Maximum C-Message Noise (dBrnC0)									
	0-50		51-100		101-200		201-400		401-1000	
	AL	IAL	AL	IAL	AL	IAL	AL	IAL	AL	IAL
D	27	29	27	29	27	29	27	29	27	29
D1	30	35	30	35	30	35	30	35	30	35
C + L/C	30	32	NA	NA	NA	NA	NA	NA	NA	NA
D + L/C	29	32	30	33	30	35	30	37	30	39
D1 + L/C	32	38	32	39	32	40	32	37	32	39
CAC + L/C	29	32	29	33	30	35	NA	NA	NA	NA
CAC1 + L/C	30	32	32	39	33	40	NA	NA	NA	NA
D + C + L/C	31	38	31	39	31	39	31	39	31	39
D1 + C + L/C	33	38	33	39	33	39	33	39	33	39
CAC + C + L/C	31	38	31	39	32	40	NA	NA	NA	NA
CAC1 + C + L/C	32	38	33	39	34	41	NA	NA	NA	NA
D + CAC + C + L/C	32	38	32	39	33	41	33	41	33	42
D + CAC1 + C + L/C	33	38	34	39	35	41	35	41	35	42
D1 + CAC + C + L/C	33	38	33	39	34	41	34	37	34	39
D1 + CAC1 + C + L/C	33	38	33	39	35	41	35	41	35	42
NCAC + C + L/C	35	38	36	39	37	41	39	43	41	45
NCAC + D + L/C	34	38	36	39	37	41	39	43	41	45
NCAC + D1 + L/C	35	38	37	39	37	41	39	43	41	45
NCAC + D + C + L/C	35	38	36	39	37	41	39	43	41	45
NCAC + D1 + C + L/C	36	38	37	39	38	41	39	43	42	45

Notes: See Notes Table in V for facility identification. The following are definitions of symbols:

D1 = Digital Carrier (D1 or equivalent)
D = Digital Carrier (D2, D3, D4, or equivalent)
C = Cable
CAC = Compandored Analog Carrier (N2, N3 or equivalent)
CAC1 = Compandored Analog Carrier (N1 or equivalent)
NCAC = Noncompandored Analog Carrier
NA = Not universally applicable
L/C = Subscriber Cable

TABLE U

C-MESSAGE NOISE
ACCEPTANCE AND IMMEDIATE ACTION LIMITS
FOR WATS ACCESS LINES BETWEEN AN END USER NETWORK INTERFACE AND A TELEPHONE COMPANY CENTRAL OFFICE

Facility Combination	Facility Length (Miles)									
	Acceptance Limits (AL) Immediate Action Limits (IAL)									
	Maximum C-Message Noise (dBrnC0)									
	0-50		51-100		101-200		201-400		401-1000	
	AL	IAL	AL	IAL	AL	IAL	AL	IAL	AL	IAL
C + SW	29	35	NA	NA	NA	NA	NA	NA	NA	NA
D + SW	27	32	27	33	27	35	27	37	27	39
D + C + SW	30	35	30	37	30	40	30	43	30	45
D1 + C + SW	32	35	32	37	32	40	32	43	32	45
CAC + C + SW	30	35	30	37	31	40	NA	NA	NA	NA
CAC1 + C + SW	31	35	32	37	34	40	NA	NA	NA	NA
D + CAC + C + SW	31	35	31	37	32	40	32	43	32	45
D + CAC1 + C + SW	32	35	33	37	34	40	34	43	34	45
D1 + CAC + C + SW	33	35	33	37	33	40	33	43	33	45
D1 + CAC1 + C + SW	33	35	34	37	35	40	35	43	35	45
NCAC + C + SW	NA	NA	NA	NA	37	40	38	43	41	45
NCAC + D + C + SW	NA	NA	NA	NA	37	40	39	43	41	45
NCAC + D1 + C + SW	NA	NA	NA	NA	37	40	39	43	41	45

Note: Following are definitions of symbols:

D1 = Digital Carrier (D1 or equivalent)

D = Digital Carrier (D2, D3, D4, or equivalent)

C = Cable

CAC = Compandored Analog Carrier (N2, N3 or equivalent)

CAC1 = Compandored Analog Carrier (N1 or equivalent)

SW = Switch

NCAC = Noncompandored Analog Carrier

NA = Not universally applicable

TABLE V

C-MESSAGE NOISE
ACCEPTANCE AND IMMEDIATE ACTION LIMITS
FEATURE GROUP A

Facility Combination	Facility Length (Miles)														
	Acceptance Limits (AL) Immediate Action Limits (IAL)														
	Transmission Type (B and C)														
	Maximum C-Message Noise (dBrnC0)														
	0-50			51-100			101-200			201-400			401-1000		
	AL	IAL B	IAL C	AL	IAL B	IAL C	AL	IAL B	IAL C	AL	IAL B	IAL C	AL	IAL B	IAL C
C + SW	29	32	32	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
D	27	29	NA	27	29	NA	27	29	NA	27	29	NA	27	29	NA
D1	30	35	NA	30	35	NA	30	35	NA	30	35	NA	30	35	NA
D + SW	27	32	NA	27	33	NA	27	35	NA	27	37	NA	27	39	NA
D + C + SW	30	32	32	30	33	33	30	35	35	30	37	37	30	39	39
D1 + C + SW	32	35	38	32	37	39	32	35	35	32	37	37	32	39	39
CAC + C + SW	30	32	32	30	33	33	31	35	35	NA	NA	NA	NA	NA	NA
CAC1 + C + SW	31	35	38	32	37	39	34	40	41	NA	NA	NA	NA	NA	NA
D + CAC + C + SW	31	35	38	31	33	33	32	35	35	32	37	37	32	39	39
D + CAC1 + C + SW	32	35	38	33	37	39	34	40	41	34	37	37	34	39	39
D1 + CAC + C + SW	33	35	38	33	37	39	33	35	35	33	37	37	33	39	39
D1 + CAC1 + C + SW	33	35	38	34	37	39	35	40	41	35	37	37	35	39	39
NCAC + C + SW	34	NA	38	36	NA	39	37	40	41	38	43	43	41	45	45
NCAC + D + C + SW	35	NA	38	36	NA	39	37	40	41	39	43	43	41	45	45
NCAC + D1 + C + SW	35	NA	38	37	NA	39	37	40	41	39	43	43	41	45	45
D + SW	27	32	32	27	33	33	27	35	35	27	37	37	27	39	39
D+D +SW*	29	32	32	29	33	33	29	35	35	29	37	37	29	39	39

Note: Following are definitions of symbols:

C = Cable

CAC = Compandored Analog Carrier (N2, N3, or equivalent)

D = Digital Carrier (D2, D3, D4, or equivalent)

D1 = Digital Carrier (D1 or equivalent)

*D + D = a "D + D" combination indicates a back-to-back digital arrangement with one digital/analog-analog/digital conversion.

NA = Not universally applicable

SW = Switch

CAC1 = Compandored Analog Carrier (N1 or equivalent)

NCAC = Noncompandored Analog Carrier

IAL B = Type B Transmission Facilities

IAL C = Type C Transmission Facilities

TABLE W

DATA TRANSMISSION LIMITS FOR FEATURE-GROUP A

DATA TRANSMISSION PARAMETER TYPE DB	IMMEDIATE ACTION LIMIT
1. Signal to C-notched noise ratio with -13 dBm0 holding tone.	30 dB
2. Envelope Delay Distortion* (a) 604 to 2804 Hz less than 50 route miles 50 route miles or more (b) 1004 to 2404 Hz less than 50 route miles 50 route miles or more	 800 μsec. 1000 μsec. 320 μsec. 500 μsec.
3. Impulse Noise (Threshold at 67 dBrnc0)	≤15 counts in 15 minutes
4. Intermodulation Distortion (a) Second order (R2) (b) Third Order (R3)	 ≥31 dB ≥34 dB
5. Phase Jitter (Degrees peak to peak)	4 Hz to 304 Hz = 7°
6. Frequency Shift	±2 Hz

* Envelope Delay Distortion limits expressed in microseconds (μsec)

5. TEST REQUIREMENTS WHEN OPTIONAL CONDITIONING IS APPLIED TO A CHANNEL

A. With C-Conditioning Applied (Table X-1)

5.01 The C-Conditioning option, when applied to VG5, VG6, VG7, VG8, VG9 and VG10, calls for improved Attenuation Distortion and Envelope Delay Distortion limits for these Special Access Services. Table X (Part 1) provides these acceptance and immediate action distortion limits when C-Conditioning is applied.

B. With Optional Improved Distortion (Table X-2)

5.02 Table X (Parts 2 and 3) provides the immediate action and acceptance limits for optional improved Attenuation Distortion and optional improved Envelope Delay Distortion (VG5, VG6, VG7, VG8, VG9, VG10, and VGC). These options may be ordered separately or in combination.

C. With Data Capability Applied (Table Y)

5.03 The Data Capability option, when applied to VG6, VG7 and VG10, calls for improved C-Notched noise and Intermodulation Distortion limits. Table Y provides these improved limits.

D. With C- and Data Capability Applied (Tables X and Y)

5.04 When both C- and Data Capability are applied (Voice-Grades 5, 7 and 10), Tables X and Y should be followed.

E. With T-Conditioning Applied (Table Z)

5.05 Table Z provides the improved distortion requirement for optional T Conditioning when applied to Voice Grade 11.

F. Echo Control Limits - VG 1 - 12 and WATS Access Lines (Table AA)

5.06 Table AA provides the echo control immediate action and acceptance limits for Voice Grades 1 through 12.

TABLE X

(Part 1)

C-CONDITIONING OPTIONS

(Notes 1 and 2)

PARAMETER	FREQUENCY BAND	ACCEPTANCE LIMIT	IMMEDIATE ACTION LIMIT
ATTENUATION DISTORTION	504 to 2804 Hz 304 to 3004 Hz	-0.5 dB to +2.5 dB -1.5 dB to +5.5 dB	-1.0 dB to +3.0 dB -2.0 dB to +6.0 dB
ENVELOPE DELAY DISTORTION	1004 to 2604 Hz 604 to 2604 Hz 504 to 2804 Hz	475 μsec. 1450 μsec. 2950 μsec.	500 μsec. 1500 μsec. 3000 μsec.

Notes:

1. C-Conditioning is available for Special Access services Voice Grade 5 thru 10 and VGC.
2. All limits in dB are variations from measurements made at 1004 Hz. The "+" limit means more loss and the "-" means less loss from the reference frequency.

TABLE X

(Part 2)

IMPROVED ATTENUATION DISTORTION

FREQUENCY BAND	ACCEPTANCE LIMIT	IMMEDIATE ACTION LIMIT
404 to 2804 Hz 304 to 3004 3004 to 3204	-0.8 to +1.5 dB -0.8 to +2.5 dB -1.5 to +5.5 dB	-1.0 to +2.0 dB -1.0 to +3.0 dB -2.0 to +6.0 dB

TABLE X

(Part 3)

IMPROVED ENVELOPE DELAY DISTORTION

FREQUENCY BAND	ACCEPTANCE LIMIT	IMMEDIATE ACTION LIMIT
1004 to 2604 Hz	85 μsec	100 μsec
804 to 2604 Hz	150 μsec	200 μsec
604 to 2604 Hz	250 μsec	300 μsec
504 to 2804 Hz	550 μsec	600 μsec
504 to 3004 Hz	2950 μsec.	3000 μsec

Note: These improved conditioning options are available for Special Access Services Voice-Grades 5, 6, 7, 8, 9, 10 and VGC (customized).

TABLE Y

DATA CAPABILITY OPTION

(Notes 1, 2 and 3)

PARAMETER	ACCEPTANCE LIMIT	IMMEDIATE ACTION LIMIT
Signal to C-Notched Noise Ratio	34 dB	32 dB
Intermodulation Distortion	R2 $\geq$40 dB R3 $\geq$44 dB	R2 $\geq$38 dB R3 $\geq$42 dB

Notes:

1. Data Capability is available for Special Access Services Voice-Grades 6, 7, and 10 and improves C-notched noise and intermodulation distortion performance.
2. Signal to C-notched noise measurements are made using a -13 dBm0 holding tone.
3. All limits are variations from the measurement at 1004 Hz. The "+" means more loss and the "-" means less loss than the reference frequency.

TABLE Z

T-CONDITIONING OPTIONS

(Notes 1 and 2)

PARAMETER	FREQUENCY BAND	ACCEPTANCE LIMIT	IMMEDIATE ACTION LIMIT
ATTENUATION DISTORTION	304 to 3204 Hz 503 to 3004 Hz	-1.0 dB to +2.5 dB -0.5 dB to +1.5 dB	-1.0 dB to +2.5 dB -0.5 dB to +1.5 dB
ENVELOPE DELAY DISTORTION	1004 to 2604 Hz 804 to 2804 Hz	$\leq$75 μsec. $\leq$130 μsec.	$\leq$110 μsec. $\leq$180 μsec.

Notes:

1. T-Conditioning improves frequency response and envelope delay distortion. T-Conditioning is available for Special Access Services Voice Grade 11.
2. All limits in dB are variations from measurements made at 1004 Hz. The "+" limit means more loss and the "-" means less loss from the reference frequency.

TABLE AA

(Sheet 1 of 2)

ECHO CONTROL IMMEDIATE ACTION AND ACCEPTANCE LIMITS FOR VOICE GRADES 1 THROUGH 12

ALL VOICE GRADE CIRCUITS			ACCEPTANCE LIMITS		IMMEDIATE ACTION LIMITS	
MEASURED AT	TERMINATE AT	MEASUREMENT	ERL (dB)	SRL (dB)	ERL (dB)	SRL (dB)
Effective 2-wire Facility						
End User 2W POT or 2W CO.*	4W POT Standard**	RL	5.5	3.0	5.0	2.5
End User 2W POT or 2W CO.*	4W POT Improved**	RL	15.0	9.0	13.0	8.0
Interexchange Carrier 4W POT	End User 2W POT or 2W CO*	ELEPL1	7.0	4.5	5.5	2.5
Interexchange Carrier 4W POT	End User 2W POT or 2 W CO*	ELEPL2	18	12	16	11
EFFECTIVE 4-WIRE FACILITIES						
End User 2W POT or 2W CO*	Interexchange Carrier 4W POT	RL	26	20	24	18
Interexchange Carrier 4W POT	End User 2W POT or 2W CO*	ELEPL	23	16	20	14

* If the End User POT is a Centrex Central Office, these values apply with 2 dB pad *in* the circuit.

** Selection of improved echo control limits may require additional equipment at the End User's premises.

TABLE AA

(Sheet 2 of 2)

ECHO CONTROL IMMEDIATE ACTION AND ACCEPTANCE LIMITS FOR WATS ACCESS LINES

WATS ACCESS LINES			ACCEPTANCE LIMITS		IMMEDIATE ACTION LIMITS	
MEASURED AT	TERMINATE AT	MEASUREMENT	ERL (dB)	SRL (dB)	ERL (dB)	SRL (dB)
EFFECTIVE 2 WIRE FACILITY						
End User 2W POT	2W CO Standard**	RL	5.5	3	5	2.5
End User 2W POT	2W CO Improved**	RL	14	7	13	6
EFFECTIVE 4 WIRE FACILITY						
End User 4W POT	2W CO	ELEPL	19	12	15	9

Following are definitions of terms used in this table

ELEPL = Equal Level Echo Path Loss
RL = Return Loss
ERL = Echo Return Loss
SRL = Singing Return Loss
CO = Central Office
POT = Point of Termination
2W = 2 Wire
4W = 4 Wire